IMPERIAL MYCOLOGICAL INSTITUTE

REVIEW
OF
APPLIED MYCOLOGY

VOL. XX MAY 1941

MOORE (W. C.). **New and interesting plant diseases.**—*Trans. Brit. mycol. Soc.*, xxiv, 3–4, pp. 345–351, 2 pl., 1940 [issued 1941].

Continuing his observations on uncommon plant diseases in England [*R.A.M.*, xix, p. 597], the writer refers to his previous account of a new infection of apple leaves in Surrey tentatively attributed to *Phyllosticta angulata* and since reported from other south-eastern localities by Wormald, who stated *in litt.* that the colour of the lesions on inspection in August was typical of angular leaf spot, and that some of them bore the *Phyllosticta* and the *Cladosporium* (probably *C. herbarum*) found in earlier examinations. The froghopper *Cercopis sanguinea* was shown to be implicated in the etiology of an angular leaf spot of apple and pear trees in Kent [loc. cit.], and in the writer's experiments at Harpenden in early June, 1940, the introduction of a few individuals of the insect on to apple leaves on a muslin-covered branch resulted in the rapid development of typical reddish-brown, angular lesions, which on a subsequent inspection in August also bore *P. angulata* and a *Cladosporium*. It would therefore appear that the froghopper is the primary cause of the trouble, the fungi merely developing as saprophytes in the necrotic tissues.

The symptoms of the lettuce leaf spot caused by *Septoria lactucae* [ibid., xvii, p. 703] are described and the taxonomy of the pathogen discussed, this being apparently the first report of its occurrence in England, notwithstanding its wide distribution, embracing Italy, Germany, Denmark, France, Yugoslavia, the United States, the Argentine, Japan, and China. The writer has consulted Passerini's specimen No. 746 *Erb. Critt. Ital.* and concludes that the name *S. lactucae* Pass. (1878), which antedates *S. lactucae* Peck (1879), is valid. The disease was at first restricted to the outer leaves of Cos lettuce of the Little Gem variety, but infection spread later in a milder form to the foliage of Ideal (cabbage type). An examination of the Cos seed revealed the presence of pycnidia of *S. lactucae* on 4 to 5 per cent. of the material, suggesting that this was the source of infection.

Pythium ultimum, one of the agents of a tulip rot recently reported from a Buckinghamshire nursery [ibid., xix, p. 598], was found to be attacking *Colchicum* corms in the same place. The disease is characterized by crater-like holes, 1 to 1½ in. across, partly filled with soft, wet, rotten tissue, on the sides or top of the corm, the surrounding skin sometimes being soft, slightly sunken, and pale greyish-brown for

distances up to 1 in. On sectioning, the flesh underlying the lesions was found to be a pink- or brown-tinged greyish colour, deepening to brown, reddish-brown, or blackish on exposure to the air. In one case of slight infection the rot had evidently originated at a wound on the side of the corm and spread in the superficial tissues to produce a pale chocolate-brown band, ½ in. in width, extending from the top of the corm to the basal plate. The trouble is stated to be of annual occurrence in *C. speciosum* [var.] *album* and prevalent on *C. byzantinum*; the hybrids President Coolidge and Lilac Wonder are also susceptible, but *C. s.* var. *illyricum* appears to be highly resistant, contracting no trace of infection in inoculation experiments with pure cultures of *P. ultimum* isolated from *Colchicum* and tulip. Both strains induced watery wound rot in injured Duke of York potato tubers kept for three days in moist dishes at 22° C., and caused decay of tulip bulbs under similar conditions. *C. byzantinum* and *C. s.* var. *album* also responded positively to the inoculations, the former very slowly.

Plant diseases. Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, li, 11, pp. 632–636, 3 figs.; 12, pp. 682–686, 3 figs., 1940; lii, 1, pp. 38–43, 4 figs., 1941.

In these notes on plant diseases in New South Wales it is stated that outbreaks of cucurbit mosaic [*R.A.M.*, xvii, p. 157; xviii, p. 726] are usually due to planting diseased seed. Affected seedlings are much dwarfed, and make slow growth. The first leaves are not, as a rule, mottled, but show a yellow discoloration round the margins, which may collapse and burn off. Aphid infestation of young cucurbits is very prevalent in spring, the insects spreading infection from diseased seedlings, as well as from numerous weeds and crop plants harbouring the cucumber mosaic virus. Affected plants grown from diseased seed seldom show conspicuous mottling, but plants contracting the disease as a result of aphid attack may develop pronounced symptoms. Partial recovery may occur as a result of masking of the symptoms by high temperatures. The control measures recommended consist in using seed from healthy plants only, sowing more seeds than are required at each hill, roguing out backward and abnormal seedlings early in the season, and practising weed control.

Some strains of chrysanthemum become affected by rust (*Puccinia chrysanthemi*) [ibid., xvii, pp. 460, 703] towards the end of the growing season, though infection seldom does much harm, and some varieties appear to be resistant. All infected leaves (including fallen ones) should be removed and burned, and the plants should be sprayed with lime-sulphur or a colloidal sulphur spray, or dusted with finely divided sulphur. After flowering, all the above-ground parts should be removed and burned.

During September, 1940, *Phyllachora pastinacae* was recorded on parsnip [ibid., x, p. 706], *Sclerotinia sclerotiorum* on carrot, and tomato spotted wilt on *Sonchus oleraceus*.

In the second paper it is stated that potato brown rot (*Bacterium solanacearum*) [ibid., xix, p. 69] is most common in the coastal areas, particularly on the North Coast. For control purposes, only disease-free tubers should be used. Crop rotation should be practised, highly susceptible crops being planted in the same land only once every three

or four years. Commercial sulphur should be added to the soil, followed by lime after a few months [ibid., xviii, p. 473].

As nearly all the important diseases of linseed and flax are seed-borne, all seed should be dusted before being sown with ceresan or agrosan at the rate of 2 oz. per bush. All seed of linseed or flax introduced into New South Wales from overseas for experimental purposes is examined for the presence of disease. Recently, three lots of seed from Abyssinia, Lithuania, and Canada were found to be infected with anthracnose (*Colletotrichum linicolum*) [*C. lini*: ibid., xix, pp. 656, 707], the Lithuanian sample also showing heavy infection by *Polyspora lini* [ibid., xviii, p. 256]. The only major disease of linseed so far recorded in New South Wales is rust (*Melampsora lini*) [ibid., xix, p. 707], to which the Punjab variety is locally very susceptible, though several commercially satisfactory and resistant varieties are shortly to be released to growers. These new varieties are reputed to be resistant to *Fusarium lini* [loc. cit.], suspected cases of which are stated to be under investigation.

Root and crown rot of carrots at Emu Plains was caused by *Sclerotium rolfsii* [ibid., xviii, p. 444], the first record of this fungus on carrots in New South Wales.

In the third paper of this series, root rot due to *Fusarium martii phaseoli* [*F. solani* var. *martii*: *R.A.M.*, xviii, p. 811] is reported to have been more prevalent than usual in New South Wales in 1939 and 1940 on French beans [*Phaseolus vulgaris*], losses of up to 95 per cent. of the crop being recorded on Stayley's Surprise variety. Rotation keeps the disease in check, and at least three years should elapse between bean crops on any particular soil. Under local conditions, the dwarf varieties Tweed Wonder, Canadian Wonder, Hawkesbury Wonder, and Brown Beauty (Premier) are fairly resistant, and may be grown without risk of serious loss. Stayley's Surprise, which is synonymous with Prince (Sutton's, England), should not be planted except in land known definitely to be free from infection. No newly introduced variety should be planted in infested soil until it has been ascertained to show satisfactory resistance.

Growers of early coastal peach varieties are warned against overlooking the effect of rust [*Puccinia pruni-spinosae*: ibid., xviii, p. 190] in indirectly shortening the economic life of the trees through premature defoliation. The spray programme recommended is Bordeaux mixture (6–4–40) or lime-sulphur (1 in 20) before blossom-bud burst, together with monthly applications of colloidal sulphur (1 or 2 lb. per 100 gals.) or wettable sulphur (4 or 5 lb. per 100 gals.). The sulphur applications should start not later than the first week in September and continue until early or mid-summer, according to the showeriness of the season. Peach varieties harvested locally before Christmas do not tolerate lime-sulphur applications after blossom-bud burst.

Plant pathology and physiology.—*Rep. Tex. agric. Exp. Sta., 1939*, pp. 84–95, [? 1940].

This report [cf. *R.A.M.*, xix, p. 518] contains, *inter alia*, the following items of interest. W. N. Ezekiel states that in co-operation with the late J. J. Taubenhaus sclerotia of *Phymatotrichum omnivorum* from a carrot field were placed in small vials of moist Houston soil in October,

1929, and stored. Germination fell to 12, 10, and 8 per cent. after 5, 6, and 7 years, respectively. None of the sclerotia from the last three containers, opened after 9, 9½, and 10 years, respectively, germinated.

In studies on the variation of *P. omnivorum* under field conditions a root rot-proof container was made of sulphur slabs in 1935 and a pure culture of *P. omnivorum* was inoculated into cotton plants grown inside. Cotton was planted in the container every year, and re-isolations were made periodically. Cultures obtained in this manner in 1939 agreed perfectly with the strain originally employed. One strain maintained in culture since August, 1929, has retained its original characteristics and its pathogenicity after ten years in culture.

P. omnivorum was recovered from 21·8 per cent. of a lot of experimentally girdled cotton plants growing at the advancing edges of root rot patches, from 9·5 per cent. of plants with the entire tops removed, and from 31·4 per cent. of the controls. The corresponding figures for two seasons together (including these) were 21·3, 14·5, and 31·8 per cent., respectively. Both topping and girdling also reduced the vigour of the fungus while it was still alive. In another experiment in a badly affected area plants girdled in July, 1938, showed in 1939 only one plant affected, and the disease failed to spread from this plant, though root rot attacked plants occupying, respectively, 12 and 13 per cent. of the area in the adjoining check plants.

When plants of different ages were inoculated with *P. omnivorum*, 71·1 per cent. of those 14 weeks old at the date of inoculation succumbed, the corresponding figures for those 10, 6, and 3 weeks old being 60·4, 42·4, and 16·6 per cent., respectively. In the final planting, made at the time of inoculation, 2·9 per cent. succumbed, while in a duplicate of this planting, in which the seedlings were exposed to infection (as a result of proximity) from the oldest plants, the figure was 2 per cent.

In greenhouse inoculations by Ezekiel and H. E. Rea higher percentages of infection of cotton by *P. omnivorum* were obtained by using 35 to 50 gm. of inoculum than by using 100 to 125 gm. With plants in Houston clay, soil moisture contents of 20 and 25 per cent. (oven-dry soil weight basis) favoured the development of root rot.

In experiments by L. M. Blank on the growth response of *P. omnivorum* to inorganic nitrogen compounds, the mean weights of fungal mats produced on a standard nutrient solution with equivalent amounts of nitrogen derived from ammonium nitrate, ammonium nitrite, and potassium nitrite were in the approximate ratio of 10:5:3.

In a three-years test, G. E. Altstatt, D. T. Killough, and J. E. Roberts found that the cotton varieties Half and Half, Coker 100, D. & P.L. 11a and 12, Dixie Triumph 14–5 St. 2, and Cook 144–68 were more susceptible to *Fusarium vasinfectum* than were Rowden 2088, Cook 307, Coker's 4 in 1, Dixie Triumph 85, Miller 610, Clevewilt 6 and 7, Toole, Sikes W. R. Staple, and Dixie Triumph 12.

A. L. Harrison states that in two separate experiments tomatoes were only slightly injured by applications of cuprocide 54 (1¾ lb. to 50 gals.), malachite green (¼ lb. to 50 gals.), ZO (¾ lb. to 50 gals.), and various other preparations, whereas Bordeaux mixture (4–4–50) with or without the addition of cottonseed oil caused marked reduction in the number and weight of fruits produced.

When young Marglobe tomato plants were inoculated with *F.* [*bulbigenum* var.] *lycopersici* under various conditions in the greenhouse during August or September by dipping the roots in nutrient cultures of the fungus and setting the plants in trays or cold frames [ibid., xix, p. 309], the period of immersion (varying from instant dip to 16 minutes) had no significant effect on the results. Cultures incubated from 3 to 8 days at room temperature were more virulent than older ones. Virulence was only slightly reduced by filtering through cheesecloth to remove the mycelium. Wilt appeared on inoculated plants in Lufkin fine sandy loam adjusted to P_H values from 9·3 to 3·5, and became progressively more severe from P_H 7 to P_H 3·5. Least wilt developed at P_H 9·3 [ibid., xx, p. 150]. Both inoculated plants and controls succumbed in soil adjusted to P_H 2·9. Infection was more severe in inoculated plants in wet Lufkin fine sandy loam (56 per cent. of water-holding capacity) than in dry (14 per cent.) while in moist soil (29 per cent.) it was intermediate. Different isolates showed different degrees of pathogenicity.

Field and laboratory tests for resistance to wilt with over 250 tomato varieties, strains, and selections showed that of those tested the varieties most resistant to infection and at the same time best adapted to the Yoakum-Hallettsville area are Marglobe, Rutgers, Glovel, Grothen's Globe, and Pritchard [ibid., xix, pp. 170, 501].

G. E. Altstatt states that strains of *Sclerotium rolfsii* from watermelon, groundnut, sugar beet, and garlic produced the perfect stage. This was a hymenium bearing basidia, sterigmata, and spores, the last-named measuring 3·9 to 5·4 by 1·8 to 3·6 μ.

In the section dealing with rice diseases (pp. 170–172), A. L. Martin and C. E. Minarik state that under greenhouse conditions rice grown in soil to which sodium nitrate was applied at the rate of 240 lb. per acre, with sulphate of ammonia at 250 and 500 lb. per acre, developed typical symptoms of 'straighthead' [ibid., i, p. 83; xvi, p. 834; xix, p. 301]. Such high concentrations of nitrogenous fertilizer are, however, not likely to be found under ordinary conditions.

Dowson (W. J.). **On the systematics of Gram negative bacterial plant pathogens.**—*Chron. bot.*, vi, 9, pp. 198–199, 1941.

In this paper the author briefly sums up and clarifies the conclusions reached in his earlier contribution to the subject [*R.A.M.*, xviii, p. 658]. He points out that the division of *Pseudomonas* (Migula) Lehmann & Neumann into *Pseudomonas* and *Xanthomonas* and the selection of *X. hyacinthi* as the type species for the new genus strictly accord with the International Rules. The Gram-positive plant pathogens, e.g., *Bacterium mangiferae*, *Bact. fascians*, *Bact. flaccumfaciens*, etc., require separate treatment, as the Gram reaction appears to denote a fundamental difference in the proteins of the Gram-positive and Gram-negative bacteria, and probably indicates an absence of any close relationship.

Pugsley (A. T.). **Transmutation of bacterial plant pathogens.**—*J. Aust. Inst. agric. Sci.*, vi, 4, pp. 195–197, 1940.

The author discusses the transmutation occurring in certain bacteria

when the colonies on agar change their normal smooth type of growth to one with a rough surface, and gives a survey of work done on this subject, citing specifically the case of *Pseudomonas fluorescens* and *Phytomonas tabaci* [*Bacterium tabacum*: *R.A.M.*, xx, p. 104].

BRAUN (A. C.). **Development of secondary tumors and tumor strands in the crown gall of Sunflowers.**—*Phytopathology*, xxxi, 2, pp. 135–149, 7 figs., 1941.

Secondary tumours and tumour strands [*R.A.M.*, v, p. 23; xiv, p. 365] were experimentally induced at the Rockefeller Institute for Medical Research, Princeton, New Jersey, by the inoculation of Giant Russian sunflowers with Riker's A6 strain of *Phytomonas* [*Bacterium*] *tumefaciens* [ibid., iii, p. 386] at a distance of 4 to 6 in. from the apical bud into almost or quite fully elongated internodes. This is considered to prove that these structures are truly secondary, not being dependent for their development on the rapid elongation of immature tissue. The ridge-like overgrowths sometimes observed extending from the primary tumour to within a short distance of the soil line are also secondary.

Tumour strands and secondary tumours were invariably found in association with the xylem region. E. F. Smith's analogy of the secondary crown gall tumours with the permeation metastases of human cancers (*Science*, N.S., xliii, pp. 871–889, 1915; *J. Cancer Res.*, i, pp. 231–309, 1916, *et passim*) would seem to be invalidated by the observation that the tumour strand does not push downwards from the primary tumour in a root-like manner, but originates in the xylem region of the vascular bundle and thence expands laterally into the pith.

Two distinct types of secondary tumours are described, one occurring in the petioles and apparently similar to those previously reported by Smith *et al.* on the Paris daisy (*Chrysanthemum frutescens*), and another developing at the first and second nodes above the primary tumour, the latter type being of particular interest by reason of their internal structure. They were characterized by a marked increase in secondary xylem, as well as by a sharply defined, though somewhat enlarged cortex, thereby differing from both the primary and the first type of secondary tumour. The above-mentioned narrow, slightly raised ridges connecting the primary tumour with a point slightly above soil-level in two out of the several hundred experimental plants were found to consist largely of secondary xylem, thus closely resembling the second type of tumour.

It has been shown that secondary tumours and tumour strands may be produced by an attenuated strain of *Bact. tumefaciens* in the absence of a primary neoplasm, suggesting that the mechanism involved in the development of the primary and secondary structures may not be identical.

MILLIKAN (C. R.). **Variation in Helminthosporium sativum induced by zinc sulphate.**—*J. Aust. Inst. agric. Sci.*, vi, 4, pp. 203–205, 3 figs., 1940.

In a study conducted in Victoria the formation of sectors was observed to occur frequently in *Fusarium culmorum* and *Helminthosporium sativum* [cf. *R.A.M.*, xviii, p. 97] cultured on glucose agar

containing 0·1 to 0·5 per cent. zinc sulphate. In the case of *H. sativum* microscopic examination showed that whereas the hyphae of the parent colonies were very distorted and thickened, those of the sector were apparently normal, indicating a much greater tolerance for zinc in the latter. No sporulation was observed in either. After transfer to potato dextrose agar containing no added zinc, the relative growth rates were completely reversed, the parent colonies growing considerably faster than the sectors, while sporulation occurred in all colonies. These relative differences in growth between the parent and sector colonies still existed after six successive transfers to fresh potato dextrose agar. It is concluded from these observations that zinc had induced a stable variant in the original culture.

Rodenhiser (H. A.) & Maxwell (L. R.). **Effect of X-radiation on the germination of chlamydospores of Ustilago hordei.**—*Phytopathology*, xxxi, 2, pp. 175–181, 1 fig., 1 graph, 1941.

The germination percentage of the chlamydospores of *Ustilago hordei* from Trebi barley was shown not to be materially impaired by exposure to X-rays in dosages up to 100 kiloroentgen (kr.), upwards of which the number of non-viable spores and the time required for the germination of the viable increased irregularly up to total destruction at 1,000 kr. Increased elongation of the promycelia resulted from the irradiation of the chlamydospores at certain dosages, becoming noticeable at 30 kr. and progressively more conspicuous at 60, 100, and 150 kr., the length at the last-named figure being some three times the normal. At 200 kr. and above, the promycelial length ranged from half to three times the normal, while at still higher dosages the tendency to elongation decreased until at 500 kr. none exceeding the average was observed. A normal number of primary sporidia developed on promycelia from chlamydospores irradiated up to 60 kr., but at 100 only 10 per cent. of the promycelia bore these organs, while at and above 150 kr. only an occasional one appeared.

The normal growth processes of the smut were found to be inhibited by lower X-ray dosages than those requisite to destroy the mechanism responsible for germination. For instance, although up to 80 per cent. of the chlamydospores germinated after irradiation at 300 kr., development ceased with the elongation of the mycelium. The term 'delayed killing' is suggested for this effect.

The rate of mutation in cultures of monosporidial lines of *U. hordei* was not affected by X-irradiation of the chlamydospores at 50 and 100 kr.

Johnson (T.). **Longevity of teliospores of Puccinia graminis under laboratory conditions.**—*Phytopathology*, xxxi, 2, pp. 197–198, 1941.

In laboratory experiments at the Dominion Laboratory of Plant Pathology, Winnipeg, periods of storage ranging from two to three years, preceded by freezing for up to 12 months, did not appear to impair the germinability of the teleutospores of various races of *Puccinia graminis tritici* and *P. g. avenae*, while the pathogenicity of their sporidia to barberry was also maintained. *P. g. secalis* from rye withstood 2½ years' freezing without loss of these properties. The longest storage periods (6 years 2½ months and 4 years 4 months, for

P. g. tritici race 9 and *P. g. avenae* race 3, respectively), did not appreciably reduce germinability but induced a weakening of virulence towards barberry.

VAN DER PLANK (J. E.) & VAN NIEKERK (O. T.). **Bleaching of sooty blotch from Oranges.**—*Fmg S. Afr.*, xvi, 178, pp. 27–28, 1941.

All bleaching solutions currently used in South Africa for the control of sooty blotch [*Gloeodes pomigena*: *R.A.M.*, xx, p. 58] of oranges are stated to be based on bleaching powder, ordinary brands of which contain 30 to 33 per cent. available chlorine. Recent trials have now demonstrated the superiority of a commercial brand of calcium hypochlorite sold under the name of H.T.H., which contains about 70 per cent. available chlorine. Other brands on the market would also probably be useful. H.T.H. contains far less calcium hydroxide than does bleaching powder, and therefore requires less boric acid or sodium bicarbonate to neutralize it, thus effecting a considerable saving in bulk and cost. About 100 lb. of H.T.H. and 20 lb. sodium bicarbonate make a bleach as active as 200 lb. ordinary bleaching powder and 150 lb. sodium bicarbonate, the costs of materials for the two treatments being £2. 12*s.* 1*d.* and £3. 14*s.* 0*d.*, respectively. The former solution is also more easily prepared.

A way of saving sodium bicarbonate when using bleaching powder, is to mix the latter well with water at the rate of 4 oz. or more per gal. and to discard all undissolved residue, which is mostly calcium hydroxide, before adding sodium bicarbonate. The ordinary phenolphthalein indicator for determining acidity in juices may be used to show whether sufficient sodium bicarbonate has been added. When using bleaches as disinfectants against mould spores on the surface of the fruit, more success is achieved by making them up with boric acid instead of sodium bicarbonate. When the latter is used, however, better disinfection may be obtained with higher strengths of chlorine, if soda ash is added in order to stabilize the solution.

WAGER (V. A.). **Leaf markings for diagnosing psorosis or scaly-bark in Citrus.**—*Fmg S. Afr.*, xvi, 178, pp. 29–30, 1 fig., 1941.

Citrus trees suffering from psorosis [*R.A.M.*, xix, p. 86] in the White River and Rustenburg districts of the Transvaal exhibited typical leaf symptoms [ibid., xviii, p. 100], which were also present on a large number of trees that showed no bark symptoms. The importance of leaf symptoms for the diagnosis of psorosis is emphasized. It is suggested that the South African citrus industry should adopt the recent Californian scheme, whereby nurserymen are enabled to obtain budwood from trees officially registered as free from disease.

BAIN (F. M.). **Report on the Coconut growing areas of Jamaica.**—*Bull. Dep. Sci. Agric. Jamaica*, N.S., 22, 12 pp., 1 diag., 1940.

During 1940, the author visited Jamaica to make an investigation into the causes of the death of coco-nut palms in the western end of the island from a condition termed locally 'western-end bud rot' to distinguish it from true bud rot (*Phytophthora palmivora*) [*R.A.M.*,

xvi, p. 300], which is common on the eastern side. The available evidence (symptoms, and soil and climatic conditions) indicated that the condition was identical with bronze leaf wilt [ibid., xx, p. 111]. In discussing the relations between soil conditions and the disease, the author mentions the three main soil types on which bronze leaf wilt occurs and states that to ensure healthy growth for many years without the application of soil improvement methods, a soil depth sufficient to allow good root penetration to 4 ft. and an average rainfall of 60 to 70 in. are necessary. In Jamaica, the coco-nut-growing area in which the rainfall and soil conditions approximate to those necessary for the occurrence of the disease extends from St. Ann's Bay to Haughton Court; elsewhere, soil conditions of class (1) type [loc. cit.] would have to be present before the disease could occur. Soil of class (1) type occurs at Haughton Court, Point, Blue Hole, Mosquito Cove, Tryall, Bengal, and in small areas elsewhere. Soil of class 2 (*a*) is present at Bengal and Point, in the very low rainfall zone. Soil of class 2 (*b*) is found at Haughton Court, while one area at Flint River has class (3) soil. Details are given of the remedial measures applicable to these different soil types.

Other coco-nut palm diseases observed in Jamaica include bitten leaf (*Thielaviopsis* sp. [*Ceratostomella* ? *paradoxa*]) [or *P. palmivora*: ibid., xx, p. 112], bleeding stem [loc. cit.], usually due to 'shot hole borer' infestation of injuries made by machettes, leaf blight (generally caused by lack of drainage), and St. Mary's disease, a condition apparently resulting from mechanical strain on the affected whorl of leaves.

Weindling (R.), Miller (P. R.), & Ullstrup (A. J.). **Fungi associated with diseases of Cotton seedlings and bolls, with special consideration of Glomerella gossypii.**—*Phytopathology*, xxxi, 2, pp. 158–167, 3 figs., 1941.

Some of the information presented in this two years' survey (made in 1938 and 1939) of the fungal diseases, especially anthracnose (*Glomerella gossypii*) of cotton seedlings and bolls over a wide area, mainly comprised within the eastern section of the United States cotton belt has already been noticed from other sources [*R.A.M.*, xviii, p. 519; xix, p. 212; see also xx, p. 14], but mention may be made of the following points. The severe boll rots and characteristic pink spore masses of *G. gossypii*, as described in earlier reports of the disease, were seldom observed, the lesions for the most part consisting of limited spots indistinguishable from those produced by other organisms. This phenomenon is tentatively attributed to the unfavourable conditions for the pathogen induced by the adoption of early ripening cotton varieties of the open type. The scarcity of infection in Texas and Oklahoma may probably be ascribed to the dry climate, which precludes the survival of the fungus in a saprophytic form on the dead leaf and stem tissues from the damping-off to the boll rot phase. Evidence has been obtained to show that the admixture of infested trash with seed during ginning may be responsible for the development of damping-off in the seedlings. *Rhizoctonia* [*Corticium*] *solani*, the cause of severe damping-off, was isolated from a relatively small number of seedlings but was rather widely distributed.

MAKI (M.). **On the control of Crossocosmia sericariae Corn., a parasite of the Silkworm, by parasitic fungi.**—*Agric. & Hort.*, xv, 6, pp. 1279–1282, 1940. [Japanese. Abs. in *Rev. appl. Ent.*, A, xxix, 2, p. 88, 1941.]

Full-fed larvae of *Sturmia* (*Crossocosmia*) *sericariae*, a parasite of the silkworm (*Bombyx mori*) in Japan, were inoculated with *Spicaria fumoso-rosea* [*R.A.M.*, xviii, p. 380] prior to pupation in the soil. After 23 days a white growth appeared on both ends of the pupae, which were kept at a temperature of 15° to 30° C., and red spores were produced in 55 days. In soil saturated with moisture the percentage of infested pupae was high. In the laboratory the fungus also attacked silkworms, but it does not do so under field conditions. The best method of using it for the control of the parasite is probably by scattering the spores of *S. fumoso-rosea* in pupation sites.

SHAW (F. W.) & REID (D. J.). **Fungi and fungous diseases.**—*J. Lab. clin. Med.*, xxvi, 1, pp. 256–262, 3 figs., 1940.

The writers describe the clinical symptoms of several of the less familiar mycotic infections, namely chromoblastomycosis (*Phialophora verrucosa*, *Hormodendrum pedrosoi*, and *H. compactum*) [*R.A.M.*, xx, p. 164], *Torula* meningitis (*T. histolytica*) [*Debaryomyces neoformans* [ibid., xx, p. 115], and systemic histoplasmosis (*Histoplasma capsulatum*) [ibid., xx, p. 61], and indicate laboratory procedures for their diagnosis and differentiation from other diseases with which confusion is possible.

SMITH (L. M.). **Blastomycosis and the blastomycosis-like infections.**—*J. Amer. med. Ass.*, cxvi, 3, pp. 200–204, 4 figs., 1 diag., 1941.

The author has compiled a useful survey of some important aspects of the blastomycoses and kindred diseases, with special reference to their differentiation in practice, to facilitate which tables are given showing the geographical distribution of the infections, their clinical pictures and the prognosis as to the course of the illness, and their appearance in the tissues and in culture (also represented diagrammatically). The fungi listed in this connexion are *Blastomyces* [*Endomyces*] *dermatitidis*, *Coccidioides immitis*, *Paracoccidioides brasiliensis* [*R.A.M.*, xx, p. 163], *Hormodendrum pedrosoi*, *Phialophora verrucosa* [see preceding abstract], *Monilia* [*Candida*] *albicans*, *Sporotrichum schenckii* [see next abstract], *Scopulariopsis brevicaulis*, *Rhinosporidium seeberi* [ibid., xx, p. 18] (not grown artificially), and *Histoplasma capsulatum* [see preceding abstract]. Intracutaneous tests with fungous antigens (coccidioidin, blastomycin, sporotrichin, and oidiomycin) have afforded some assistance in diagnosis, but must not be regarded as absolutely specific for the purpose.

VIDAL (A.). **Esporotricosis en Honduras.** [Sporotrichosis in Honduras.] —*Rev. méd. Hond., 1939*, p. 199, 1939. [Abs. in *Bol. Ofic. sanit. panamer.*, xix, 2, p. 170, 1940.]

Sporotrichosis is stated to be of common occurrence in Honduras, where a number of cases have been observed and confirmed by cultural

studies since 1932. *Sporotrichum beurmanni* [*R.A.M.*, xviii, p. 178] was the agent of the disease in a 22-year-old male patient whose case is described, while *S. schenckii* [ibid., xix, pp. 93, 557] was responsible in other instances.

Thorner (Juliet E.). **Coccidiomycosis. Relative values of coccidioidin and tuberculin testing among children of the San Joaquin Valley.** *Calif. West. Med.*, liv, 1, pp. 12–15, 2 graphs, 1941.

Tests were conducted simultaneously with 0·1 c.c. of Koch's O.T. 1:1,000 and coccidiodin from *Oidium coccidioides* [*Coccidioides immitis*] on 267 children [*R.A.M.*, xix, p. 472] selected at random from the Pediatric Clinic of the Kern General Hospital, and ranging in age from five months to 19 years. There was found to be a noticeably higher incidence of coccidioidin over tuberculin reactors as the period of residence in Kern County increased, amounting to 76 over 25 per cent. after ten years. Among a group of 42 patients with markedly positive skin reactions to the coccidioidin the stomach washings of only two proved positive for the fungus on culture and guinea pig inoculation. The lower ratio of 'valley fever-coccidioidin' reactors observed in this and other surveys [ibid., xix, p. 593] points to the relatively benign as well as universal nature of the primary phase of coccidioidomycosis as it exists in the San Joaquin Valley. Progression into the later and severe granulomatous stage of the disease only takes place when tissue and lymphatic resistance are overcome and generalized dissemination is effected through the blood stream.

Emmons (C. W.), Hailey (Howard), & Hailey (Hugh). **Chromoblastomycosis: report of the sixth case from continental United States.** *J. Amer. med. Ass.*, cxvi, 1, pp. 25–28, 4 figs., 1 map, 1941.

The writers' case of chromoblastomycosis, the sixth to be reported from the United States, occurred in a 68 year-old farmer at Atlanta, Georgia, and presents three features of special interest, viz., the early diagnosis (at three months) of the disease, the unusual site of the lesion (dorsum of the left wrist), and the satisfactory response to potassium iodide therapy. The fungus isolated from the patient was entirely typical of *Hormodendrum pedrosoi* [*R.A.M.*, xx, p. 16]; it is fully described, with some considerations on its taxonomy and on the terminology of the associated disease.

Da Fonseca (O). **Brésil.** [Brazil.] *Bahia méd.*, *1939*, p. 33, 1939. [Abs. in *Bol. Ofic. sanit. panamer.*, xix, 2, pp. 166–167, 1940.]

Two types of 'piedra' have hitherto been recognized in Brazil, one very rare caused by *Trichosporon giganteum* [*R.A.M.*, xviii, p. 526], and the other, due to *Piedraia hortai* [ibid., xviii, p. 800], rife, especially among students. *Cladosporium werneckii* [ibid., xviii, p. 593] is responsible for a mild disturbance of the palms of the hands (tinea nigra palmaris) which appears to be peculiar to Brazil. Ringworms proper, though mostly cosmopolitan, also present certain problems of special interest in the country, notably those connected with the widespread interdigital epidermophytoses of the feet [*Trichophyton interdigitale*]

and their treatment by vaccinotherapy. 'Chimbêrê', a malady confined to certain native Indian tribes occupying the remote regions of the Brazilian-Bolivian frontier, is caused by *Endodermophyton roquettei* [ibid., x, pp. 105, 665], the agent of tinea imbricata or tokelau among the aborigines of the Pacific islands. The prevalent type of blastomycosis encountered is that associated with *Hormodendrum pedrosoi* [the taxonomy of which is discussed: see preceding abstract]. Of the blastomycoid granulomata, the most important, by reason of its gravity and prevalence in South America, is Lutz's disease, which demands a separate discussion.

Schonwald (P.). **Fungus allergies.**—*Northw. Med., Seattle*, xl, 1, pp. 17–19, 1941.

Following a brief discussion of the problem of fungus allergy [*R.A.M.*, xx, p. 15] and a résumé of some outstanding contributions to the subject, the writer describes the results of his survey of the atmosphere in the vicinity of Seattle, Washington, for mould spores [ibid., xvii, p. 395]. The outstanding feature of the investigation was the prevalence of *Penicillium expansum*, the agent of decay in apples, which may serve as a reservoir of infection. *Alternaria tenuis* is another frequent source of allergic disorders, while species of *Aspergillus*, *Hormodendrum*, and *Trichoderma*, all occurring more or less regularly and at times in large numbers, are also definitely allergic. Among 34 cases of uncomplicated mould allergies (representing less than 10 per cent. of all the inhalatory disturbances under observation), 6 were of asthma, 8 of rhinitis, 5 of bronchitis, and 15 of skin affections. Immediate and permanent relief follows therapy with the specific fungal extract.

Orlov (F. M.). **The growth of certain dermatomycetes on different substrates.**—*Sovetsk. Vet., 1940*, 4, pp. 40–41, 1940. [Abs. in *Vet. Bull.*, xi, 3, p. 158, 1941.]

Of the 16 substrata on or in which emulsions of *Microsporon equi*, *Trichophyton equi*, and *T. gypseum asteroides* [*T. mentagrophytes*] were sown, viz., horsehair, cloth, leather, hay, oats, straw, horse dung, wood, sawdust, earth, clay, sand, brick dust, tap and distilled water, and physiological saline, the first seven gave rise to the most profuse growth, though all permitted some degree of development by the 20th day. The author has previously demonstrated the lengthy duration of viability of these fungi in stables, which should undergo thorough and repeated disinfection, together with all objects coming into contact with affected animals.

Vandaveer (R. L.) & Wildman (J. D.). **Studies on the mold mycelia count of butter.**—*J. Ass. off. agric. Chem., Wash.*, xxxiii, 3, pp. 693–709, 10 graphs, 1940.

The following conclusions are drawn from the analysis by Wildman's method [*R.A.M.*, xvi, p. 536] of 1,345 cream samples from 29 churns supplied by direct shippers, cream routes, and cream stations in different States of the American Union. The presence and growth of moulds in cream were found to be associated with the development of decom-

position flavour characteristics, which in turn arose from adverse conditions of accumulation time, temperature, and sanitation prevailing on the farms of origin, very few of those inspected operating satisfactorily in respect of all three factors. Tests on the cleanliness of certain dairy utensils by the agar slice method on 99 farms revealed the presence of yeasts and *Oidium* [*Oospora*] *lactis* [ibid., xviii, p. 595] in 75·8 per cent. With one exception, all the butters made from creams of which 50 per cent. or more were mouldy showed a minimum of 40 per cent. mould mycelia, the average air temperatures during the process of conversion exceeding 72° F. Conversely, all 11 churnings of butter with a mycelial count of or above 57 per cent. contained more than 15 per cent. badly decomposed cream. A high mycelial count in butter was almost invariably correlated with an excess of acidity in the cream.

Wildman (J. D.). **Report on mold in butter.**—*J. Ass. off. agric. Chem., Wash.*, xxxiii, 3, p. 468, 1940.

Collaborative studies, not yet completed, on mould [including *Oospora lactis*] mycelia in butter [see preceding abstract] at the laboratory of the United States Food and Drug Administration (Microanalytical Division), have already produced one result worthy of immediate note. F. R. Smith, using the mould mycelia technique [*R.A.M.*, xvi, p. 536], found that the addition of one or two drops of 5 per cent. crystal gentian violet to the gum-butter mixture facilitates the detection of the hyphae (unpublished data). Although a stain is usually superfluous, its use under certain conditions may be advantageous, and a recommendation has been submitted to the appropriate subcommittee of the Association of Official Agricultural Chemists for the optional use of a dye as a part of the approved method.

Laurie (A.) & Wagner (A.). **Deficiency symptoms of greenhouse flowering crops.**—*Bull. Ohio agric. Exp. Sta.* 611, 26 pp., 20 figs., 1940.

The effects of nitrogen, phosphorus, potassium, boron, calcium, iron, magnesium, manganese, and sulphur deficiencies were studied in Ohio on *Begonia semperflorens*, *Calceolaria rugosa*, carnation, Valencia chrysanthemum, cineraria, *Fuchsia hybrida*, *Gardenia veitchii*, *Pelargonium hortorum*, *Hydrangea hortensis*, *Euphorbia pulcherrima*, *Primula obconica*, Talisman rose, *Antirrhinum majus*, and Lady Gay sweet pea plants grown in sand drip cultures in the greenhouse. The visual symptoms observed, to which a key is supplied, are described for each element. Nitrogen deficiency produced severe dwarfing of the whole plant, and a uniform yellowing of all, even the young leaves, which dried slowly, remaining on the plant for some time. Phosphorus deficiency resulted in severe dwarfing of the plant, unusually dark green foliage, sometimes with a greenish-purple cast, and a marginal leaf-yellowing followed by shedding. Magnesium deficiency led to a greatly reduced rate of growth with chlorosis on the lower part of the plant, yellowing and abrupt development of necrotic areas between the veins, which remained green, with puckering of leaves or leaf abscission in some types, and scarcity of roots, delayed blooming, and poor flower colour. Calcium deficiency was manifested by the death of nearly all

the feeding roots within two to four weeks, followed by that of the terminal bud, severe stunting, and eventual death of the whole plant. Manganese deficiency induced a chlorotic condition of the top leaves, the veins remaining green. Sulphur-deficient plants showed the veins lighter in colour than the rest of the leaf, this condition being the opposite to that found in any of the other deficiencies; the top leaves were affected first and the rate of growth was much slower than in healthy plants.

Blanton (F. S.) & Haasis (F. A.). **Three additional species of aphids transmitting Narcissus mosaic.**—*J. econ. Ent.*, xxxiii, 6, p. 942, 1940.

In a previous note (*J. econ. Ent.*, xxxii, pp. 369–370, 1939) the writers reported four species of aphids, viz., *Aphis rumicis*, *Macrosiphum solanifolii* [*M. gei*], *M. rosae*, and *Myzus convolvuli*, to be vectors of the narcissus mosaic virus [*R.A.M.*, xviii, p. 680], which has since been shown by further tests at Cornell University, New York, to be transmissible by another three, namely, *Anuraphis roseus*, *M. cerasi*, and *Macrosiphum pisi*. Out of 18, 36, and 31 Sir Watkin [daffodil: *Narcissus pseudonarcissus*] plants exposed to infestation under controlled conditions by *A. roseus*, *Myzus cerasi*, and *Macrosiphum pisi*, respectively, 13, 15, and 24, respectively, developed mosaic.

Gregory (P. H.). **The control of Narcissus leaf diseases II. The effect of white mould on flower and bulb crop.**—*Ann. appl. Biol.*, xxvii, 4, pp. 472–488, 2 pl., 7 graphs, 2 diags., 1940.

In an experiment on the control of white mould of narcissus (*Ramularia vallisumbrosae*) [*R.A.M.*, xix, p. 708] conducted from 1936 to 1940 in the Scilly Isles, the effect of spraying on the flower and bulb crop was studied on the variety Golden Spur planted in a 4×4 Latin square with wide unplanted guard strips between plots. Half of the plots were inoculated in December, 1936, a few weeks after planting, by placing on the ground withered leaves bearing sclerotia and this resulted in heavy infection. It appeared that every year the uninoculated unsprayed plants lost their foliage approximately two weeks earlier than similar plants sprayed by means of a knapsack sprayer at the rate of approximately 200 gals. per acre with Bordeaux mixture 4–4–40 plus agral 2 (4 to 6 oz. per 40 gals.) as a wetter; in 1937 the inoculated but unsprayed plots withered five to six weeks earlier than sprayed ones. Inoculated plots showed no increase in flower crop in 1938 over 1937 but gave increased yields in subsequent years when infected leaves were cleaned off the beds. When dead foliage was removed, sprayed plots were able to make about as much growth in two years as the untreated plots made in three. Spraying increased the flower crop, this effect being cumulative from year to year. Thus, the number of flowers per 100 bulbs planted in 1936 was 44, 114, 147, and 250 in untreated plots in 1937, 1938, 1939, and 1940, respectively, the corresponding figures for uninoculated sprayed plots being 41, 167, 251, and 422, respectively. Spraying improved flower quality, and in 1939 the total flower weight of sprayed plants was about 15 per cent. greater than

that of unsprayed. The bulb yields from sprayed plots were after three years about 80 per cent. heavier than those from the untreated; particularly the average weight of double-nosed and mother bulbs lifted was strikingly increased. Spraying did not increase the number of bulbs lifted and had no effect on the number of 'noses' lifted from plots planted with single-nosed bulbs, but it increased that lifted from plots with double-nosed bulbs by 37 per cent.; it also increased the average 'nose' weight by 46 per cent. Spraying resulted, however, in a marked retardation of leaf and flower development (as gauged by the half-crop date, the date when half the crop matures) varying from 6 to 8 days in 1938 to 4 days in 1939. This retardation reduced the market value of the increased crop. In 1938 the effect of retardation in lowering the average value per bunch from sprayed plots was more than made good by the larger flower crop obtained on the plots planted with double-nosed bulbs, whereas on plots with single-nosed bulbs, where the crop increase from spraying was not so great, the gross return was lower than from unsprayed plots.

Green (D. E.) & Tincker (M. A. H.). **Concerning Lilies infected with the mosaic virus.**—*Lily Yearb.*, *1940* (9), pp. 28-33, 3 figs., (1 facing p. 44), 2 graphs, 1940.

Lilies most commonly affected by mosaic in England [*R.A.M.*, xviii, p. 182] include *Lilium auratum*, *L. longiflorum*, and *L. speciosum*, especially recently imported stocks. Slate's observations as regards the susceptibility of the *elegans-umbellatum* group of hybrids [in New York: ibid., xv, p. 507] could not, however, be confirmed in this country. On the other hand, he omits from his list of susceptible varieties *L. candidum*, in which the dull pattern of the mosaic is not easily distinguishable. *L. regale*, though usually raised from seeds, has been found infected at the Royal Horticultural Society's Gardens at Wisley, but must still be left in the resistant category.

Under garden conditions mosaic spread rapidly in *L. speciosum* in spite of the roguing of diseased plants and attempts to control aphids with nicotine dusts. In the fourth season less than 5 per cent. of the plants of a stock purchased in 1933 were free from infection. The succession of foliage symptoms invariably observed was vein-clearing (frequently accompanied by slight discoloration); mottling, flecking, or streaking of the leaves which tended to curl upwards; and early leaf fall. No plant recorded as infected recovered and there was no seasonal disappearance of the symptoms in plants grown out of doors. One quarter of the plants with translucent veins produced at least one normal flower but every plant with streaked or mottled leaves showed severe floral symptoms. The adhesion of the petal tips is, it is stated, not diagnostic for mosaic and must be considered in conjunction with other symptoms. Stunted plants failed to flower. The bulbs of infected plants were small and showed a tendency to split into three or four small bulbs. Diseased bulbs have shortened scales and are open at the apex, these characteristics assisting the selection of a clean stock.

L. auratum behaved similarly but the decline was more rapid and the symptoms more severe.

Jenkins (Anna E.). **Ascochyta majalis identified on Lily of the Valley in the United States.**—Abs. in *Phytopathology*, xxxi, 1, p. 13, 1941.

In a nursery in south-eastern Pennsylvania in August, 1940, an elongated area, 20 by 2 ft., near the centre of a lily of the valley plot, 50 by 25 ft., was observed to be entirely discoloured, while outside this zone the green foliage was more or less generally spotted. An examination by the writer of representative specimens revealed the presence of *Ascochyta majalis*, only two previous records of which are extant, one from Verona, Italy (1899), and the second from the Austrian Alps (1908). Until the present outbreak, the pathogenic capability of the fungus had not been recognized.

Jones (L. K.). **Bacterial wilt of Carnation.**—*Phytopathology*, xxxi, 2, p. 199, 1941.

An apparently new bacterium, studies on which are still in progress, has been found responsible for a greyish-green discoloration of the foliage, followed by yellowing and death, of greenhouse carnations at Spokane, Washington, 30, 15, and 5 per cent. of the Kathryn, Melrose, and King Cardinal varieties, respectively, having succumbed, while another 11 varieties proved susceptible in inoculation tests, the minimum incubation period being 30 days following the inoculation of punctures at the stem base. Infection is most severe during warm spring and autumn weather. Cuttings taken from plants prior to the appearance of symptoms have transmitted the causal organism.

Burkholder (W. H.) & Pirone (P. P.). **Bacterial leaf spot of Gardenia.**—*Phytopathology*, xxxi, 2, pp. 192–194, 1 fig., 1941.

Phytomonas gardeniae n. sp. is the name proposed for a pathogen causing a foliar spotting of over 100 one-year-old gardenia plants in a greenhouse, observed at New Brunswick, New Jersey, in October, 1938. The lesions were ovoid to circular, up to 6 mm. in diameter, the brown to reddish-brown centres being surrounded by a narrow, water-soaked margin. The formation of several such spots on a leaf resulted in extensive yellowing and premature defoliation, more than half the foliage (mostly the lower) having dropped by the following January. Infection was equally severe on the Belmont, Veitchii (*Gardenia jasminoides*), Mystery, Hadley, and Piersons varieties, and on *G. radicans*, and is believed from circumstantial evidence to have been introduced on southern stock: the senior author, moreover, has observed an apparently identical disease on the same host in Florida.

In inoculation experiments on Veitchii plants the pathogen gave uniformly positive results in a moist atmosphere at 70° F. or above, infection occurring readily on young leaves but developing only as very small lesions on older foliage. Infection was facilitated if the leaves were injured by pricking. *P. gardeniae* is a narrow rod, occurring in pairs and occasional chains, sometimes slightly curved, measuring after 24 hours at 27° C. 1·4 to 3·5 by 0·5 to 1 (average 2·4 by 0·75) μ, Gram-negative, with 1 or 2 polar flagella, forming white, later dirty, viscid colonies, and colouring the medium dark brown, clouding bouillon, clearing litmus milk in zones, liquefying gelatine, producing no hydro-

gen sulphide or indol, not hydrolysing starch, reducing nitrates to nitrites, utilizing with acid production dextrose, galactose, xylose, rhamnose, sucrose, maltose, mannitol, glycerol, and salicin, and evolving alkali from citric, malic, malonic, succinic, tartaric, and hippuric acid salts. *P. gardeniae* somewhat resembles *P.* [*Bacterium*] *solanacearum* in its cultural characters, but is non-pathogenic to potato. It falls into the *Pseudomonas* group of *Phytomonas* notwithstanding the apparent absence of a green-fluorescent pigment.

Black (L. M.). **Further evidence for multiplication of the Aster yellows virus in the Aster leaf hopper.**—*Phytopathology*, xxxi, 2, pp. 120–135, 1941.

This is an expanded account of the writer's studies [*R.A.M.*, xix, p. 281] on the multiplication of the aster (*Callistephus chinensis*) yellows virus in the aster leafhopper (*Macrosteles divisus*) [ibid., xx, p. 130]. The minimum incubation period of the virus in insects inoculated by mechanical means ranged from 11 to 45 days. Once the leafhoppers acquired viruliferous properties, they usually retained them until death. Better results in respect of mechanical transmission of the virus were obtained at 0° than at 25° C. The infective principle was largely destroyed in viruliferous insects by 20 minutes' freezing at −10°, and inactivated to a considerable extent during 24 hours' storage at 0° in leafhopper juice diluted to $10^{-1.5}$ with 0·85 per cent. salt solution. Experimental evidence was secured denoting that the virus multiplied at least 100-fold in the leafhoppers between the 2nd and 12th days of a 17-day incubation period, and reached a high concentration in its insect hosts six days before the latter transmitted it to asters. There is reason to believe that the virus concentration undergoes a decrease towards the end of the incubation period.

Green (D. E.). **Antirrhinum rust: IV. Improvement of rust-resistant varieties.**—*J.R. hort. Soc.*, lxvi, 3, pp. 83–86, 1941.

Much of the information in this progress report on the control of *Antirrhinum* [*majus*] rust (*Puccinia antirrhini*) in Great Britain through the development of resistant varieties has already been noticed [*R.A.M.*, xvii, p. 396], but mention may be made of the following items. Teleutospores of the fungus can survive the winter, but the alternate host they will infect has not yet been discovered. The uredospores do not normally retain their viability longer than six weeks, and it is therefore advisable to destroy all old plants at the end of the season and not to sow any seed for at least six to eight weeks thereafter. Experiments conducted with many infected seed samples sown in sterilized soil have demonstrated that the rust is not seed-borne [ibid., xix, p. 350].

The three stocks, viz., Wisley No. 3 (magenta), Orange Pink, and Terra Cotta Pink (the two latter American) showing resistance to the rust in the 1937 trials, comprising 900 plants of 16 stocks, were the only ones to maintain this reaction in the 1938 experiments on 740 plants of 21 stocks. In 1939, when 1,325 plants of 20 stocks were tested, full resistance was again exhibited by the three above-mentioned varieties, a yellow-flowered mutant from Terra Cotta Pink named Yellow Sport, and the newly imported American variety Brightness,

all of which gave equally promising results in the 1940 trials of 636 plants of 24 stocks. Provided that physiologic race 2 [ibid., xvi, p. 387] of the rust is kept out of the country, the writer hopes to improve the flowers of the present resistant varieties up to the standard of the best commercial sorts.

Jenkins (Anna E.). **A new Ascochytella on Pentstemon from California.**—*Phytopathology*, xxxi, 2, pp. 194–197, 1 fig., 1941.

Ascochytella pentstemonii n. sp. [with English and Latin diagnoses], the agent of a severe stem spot of wild *Pentstemon spectabilis* in Los Angeles County, California, is characterized by cottony, salmon-pink colonies, dark pycnidia, 55 μ in height and 110 μ in diameter (up to 400 μ in pure culture on potato dextrose agar), and clear brown, usually straight but occasionally curved, uni-, less often bi- to tri-septate conidia, 12 to 13 by 2 to 4 μ (in culture 12 to 21 [31 in the Latin diagnosis] by 4·5 to 6 μ). The lesions produced by the fungus may attain 4 mm. in diameter and expand by confluence, sometimes involving the entire stem for 10 or more cm.; they are purple at first, becoming white or pale at the centre.

Lightle (P. C.), Standring (Elizabeth C.), & Brown (J. G.). **Bacterial necrosis of the giant Cactus, Carnegiea gigantea (Cereus giganteus).**—Abs. in *Phytopathology*, xxxi, 1, p. 15, 1941.

A bacterial necrosis of the giant cactus (*Carnegiea gigantea*) is stated to have been long present in southern Arizona, and recently to have assumed an active form, causing the death of many plants. The area over which the disease extends measures 200 by 100 miles, but a much larger territory is believed to be involved. Only parenchymatous tissues are destroyed by the bacterium, which is believed to be new.

Darling (Louise). **Protocoronospora on Phoradendron flavescens in California.**—*Madroño, S. Francisco*, v, 8, pp. 241–246, 3 figs., 1940.

In the spring of 1928, mistletoe (*Phoradendron flavescens* var. *macrophyllum*) parasitic on willows and poplars on the shore of Clear Lake, California, was found infected by an apparently new disease. Brown spots, 2 to 5 mm. in diameter, appeared on the leaves, later becoming confluent and covering most of the leaf surface. Lesions averaging 1 mm. in diameter, but very closely grouped, were also present on the stems. The fungus killed the host, and formed in abundance dark, erumpent sori containing spore masses over the surface of the dead leaves and stems. It is considered to be a new species of *Protocoronospora*, and is named *P. phoradendri* n. sp. [with a Latin diagnosis]. It is characterized by amphigenous, subepidermal, erumpent acervuli, exceptionally rare, dark brown setae measuring 30 to 50 by 3 to 4 μ, clavate to cylindrical conidiophores 11 to 30 by 3 to 9 μ, conidia abstricted from the tips or, more rarely, from the sides of the conidiophores, 1 to 9 (generally 5 or 6) at a time, small sterigmata not apparent until the conidia are shed, and conidia cream in the mass, straight when young, generally falcate when mature, measuring 15 to 26 by 4·5 to 6·5 μ. Germination takes place only by the production of germ-tubes. The cultural characters are also described. The fungus differs

from *P. nigricans* in its longer acervuli, smaller setae, in the shape, size, and mass colour of the conidia, in germinating by germ-tubes and not by budding, and in its host.

Chilton (S. J. P.) & Garber (R. J.). **Effect of seed treatment on stands of some forage legumes.**—*J. Amer. Soc. Agron.*, xxxiii, 1, pp. 75–83, 1 fig., 1941.

Five seed disinfectants were tested in the greenhouse at the Pennsylvania State College for their relative efficacy in the control of damping-off [unspecified] of various species of *Lespedeza*, *Lotus*, *Medicago*, *Melilotus*, and *Trifolium*. New improved ceresan gave the largest increases in stand in *Lespedeza stipulacea*, *Medicago hispida*, *M. lupulina*, *Melilotus alba*, *M. indica*, *M. officinalis*, *Trifolium alexandrinum*, *T. hybridum*, *T. incarnatum*, *T. pratense*, *T. repens*, and the Ladino variety of the last-named, the surplus yield over the untreated controls ranging from over 3,200 per cent. in *T. alexandrinum* to 16 per cent. in *T. fragiferum* (which benefited equally from the use of vasco 4) [ibid., xvii, p. 642]. *Lotus corniculatus*, *T. dubium*, *T. glomeratum*, and *T. procumbens* failed to respond favourably to any of the treatments, *T. glomeratum* apparently being damaged by ceresan and cuprous oxide (cuprocide), while *T. subterraneum* was stunted by new improved ceresan at the maximum dose. In another test in which *M. suaveolens* was included the yield of this species was almost doubled by new improved ceresan.

In preliminary dosage studies with new improved ceresan on 12 legumes, concentrations of 1 to 1·5 per cent. generally gave the best results, but *Medicago hispida* and *T. alexandrinum* held relatively little of the dust and were most stimulated by a strength of 0·6 per cent. by weight. In two tests on *T. subterraneum*, ceresan was most effective at 1·5 and 0·75 per cent. and new improved at 0·75 and 0·375 per cent.

Considering the average relative efficiency of the five disinfectants in respect of increasing emergence and the control of post-emergence damping-off in 14 and 13 species, respectively, new improved ceresan heads the list with an average emergence of 60·4 per cent. compared with 28·1 per cent. for the controls. Ceresan, vasco 4, and Du Bay 1286 A were of some value (in the order named) for the objects in view, whereas cuprous oxide was of little or none.

Weimer (J. L.). **Austrian Winter field Pea diseases and their control in the south.**—*Circ. U.S. Dep. Agric.* 565, 15 pp., 12 figs., 1940.

Popular notes are given on the symptoms, etiology, and control of the following diseases (listed in order of destructiveness) affecting Austrian Winter field peas (*Pisum* [*sativum* var.] *arvense*) in the southern States of the American Union: leaf spot and black stem (*Ascochyta pinodella* and *Mycosphaerella pinodes*) [*R.A.M.*, xix, p. 510], both of which were experimentally shown to be viable for over a year (two according to the literature) in old stems and the former for nine months and upwards in very dry soil alone, while instances are reported of their presence in the seed in an infective state for up to five years; leaf blotch (*Septoria pisi*); root rot (largely *Aphanomyces euteiches*) [ibid., xix, p. 709]; powdery mildew (*Erysiphe polygoni*); bacterial

blight (*Phytomonas* [*Bacterium*] *pisi*); downy mildew (*Peronospora pisi*); mosaic; *Fusarium* root rot (*F.* sp.); and stem rot (*Sclerotinia sclerotiorum*).

Rotation with non-susceptible crops, such as cereals, crimson clover [*Trifolium incarnatum*], bur clover (*Medicago arabica*), and vetches (common, Monantha [*Vicia monantha* = *V. calcarata*], and Hungarian [*V. pannonica*]), is advocated as the most practical measure for the control of leaf spot, black stem, and leaf blotch. No satisfactory means of combating root rot has yet been devised, but the rotation should be as lengthy as practicable, and damp, low-lying sites should be avoided. Rotation is also effective against bacterial blight and *Fusarium* root rot, while attempts are in progress to incorporate the resistance to powdery mildew of certain strains of peas into the Austrian Winter type by crossing.

Elrod (R. P.) & Starin (W. A.). **A serological study of Erwinia amylovora isolates.**—Abs. in *J. Bact.*, xli, 1, pp. 87–88, 1941.

In studies at the Ohio University five strains of *Erwinia amylovora*, isolated from different hosts at different times, were found to be morphologically and physiologically distinguishable. Immune sera were prepared against living cultures of each strain and against somatic antigens, obtained by culturing the bacteria on phenol agar (1 in 1,000) followed by 30 minutes heating at 100° C., and from the results of agglutination tests the authors conclude that *E. amylovora* is an extremely homogeneous species from a serological point of view.

Keitt (G. W.), Clayton (C. N.), & Moore (J. D.). **Experiments with eradicant fungicides in relation to Apple-scab control.**—Abs. in *Phytopathology*, xxxi, 1, pp. 13–14, 1941.

The clover sod 'floor' of an isolated 8-acre block of McIntosh apple-trees in an orchard near Casco, Wisconsin, was sprayed at bud-break with 0·5 per cent. elgetol [*R.A.M.*, xx, p. 169] plus 0·5 per cent. monocalcium arsenite at the rate of 300 gals. per acre. Counts made on 12th June, soon after petal-fall, showed percentage reductions in scab lesions per leaf of 99 and 95 per cent. in the treated block as compared with two non-sprayed orchards 0·3 and 0·5 miles distant, respectively. The 'floor' of a similarly isolated 4-acre McIntosh orchard in quack grass [*Agropyron repens*] sod was sprayed just before bud-break with 1 per cent. elgetol extra, 400 gals. per acre, resulting in scab lesion reductions on 13th June of 89 and 97 per cent. compared with the incidence of infection in two small untreated orchards.

Sharvelle (E. G.). **An eradicant spray for the control of Apple scab and Raspberry anthracnose in Minnesota.**—Abs. in *Phytopathology*, xxxi, 1, p. 20, 1941.

Four rows of an experimental McIntosh apple orchard in Minnesota were treated in the spring of 1940 with a 'floor' spray of 0·5 per cent. elgetol [see preceding abstract] at the rate of 500 gals. per acre, and a regular spray schedule was applied to the whole orchard during the summer. In the autumn 1,000 apples selected at random from the 'floor'-sprayed rows showed only 4·1 per cent. of the fruit infected as

against 20·5 per cent. in a comparable sample from four control rows. Not only was the amount of diseased fruit reduced by the treatment, but the severity of infection was considerably mitigated.

Preliminary tests with 0·5 per cent. elgetol as a delayed-dormant spray gave promising indications in the control of raspberry anthracnose [*Elsinoe veneta*], infection by which was reduced from 100 to 80 per cent. of the 'hills' while the symptoms in the treated bushes were of a milder character than those in the controls.

Hockey (J. F.). **False sting—a virus disease of Apples.** —*Sci. Agric.*, xxi, 5, pp. 242–243, 1 fig., 1941.

In 1934 all the apples on a few apple trees in Nova Scotia were observed to show a deformity (locally termed 'false sting') superficially resembling pear stony pit [*R.A.M.*, xviii, p. 463], though no characteristic foliage or bark symptoms have been seen. Affected trees have borne 'sting' fruit regularly during their bearing years. The condition has been recognized on the varieties Gravenstein, Baldwin, Blenheim, Ben Davis, King, Northern Spy, and Tolman Sweet. Scions from an affected Baldwin tree were grafted on two young McIntosh trees in 1935, and some of the fruit produced on the McIntosh wood in 1938 and 1939 appeared to show the deformity. In 1940 the Baldwin scions and McIntosh stock each produced fruit, which in both varieties showed characteristic malformation. The condition appears to be a virus disease transmissible by grafting, and the only control would seem to consist in eradication. So far, comparatively few trees are affected.

Plakidas (A. G.). **The mode of overwintering of Entomosporium maculatum in Louisiana.**—Abs. in *Phytopathology*, xxxi, 1, p. 18, 1941.

Of recent years *Entomosporium maculatum* (the imperfect stage of *Fabraea* [*maculata*: xviii, pp. 38, 259]) has assumed a severe form on Chinese sand pears [*Pyrus serotina* var. *culta*] in Louisiana, causing extensive defoliation in early summer. Dead leaves, which have long been observed to act as the source of inoculum, were examined periodically during the winter and spring of 1939–40 without yielding any ascospores, but conidia were found in abundance on overwintered material in the spring. Infection was obtained by placing dead leaves in cheesecloth bags on leafing pear branches in early spring. Under local conditions, therefore, the pathogen appears to hibernate in the mycelial stage on the dead foliage and produce conidia in the spring.

Richards (B. L.) & Hutchins (L. M.). **A new virosis of Peach in Utah, resembling X-disease (yellow-red virosis).**—Abs. in *Phytopathology*, xxxi, 1, p. 19, 1941.

A virus disease of western chokecherry (*Prunus demissa*) and peach somewhat resembling X-disease (yellow-red virosis) [*R.A.M.*, xix, p. 548] was first observed in northern Utah on the former host in 1937 and on the latter in 1939, since when the prevalence of infection has increased in both species, ranging from a trace to 80 per cent. in the peach orchards inspected in 1940; older trees are the most susceptible. All 40 Elberta nursery trees inoculated by grafting on 26th July, 1940,

developed infection within six weeks. Distribution studies have shown that a high incidence of the new virus may be present on peaches in situations one mile or more distant from affected *P. demissa*, and in the area involved free spread from peach to peach may be assumed.

HOPPERSTEAD (S. L.) & MANNS (T. F.). **Buds as a factor in the overwintering of shot-hole of Peach (Phytomonas pruni).**—Abs. in *Phytopathology*, xxxi, 1, p. 12, 1941.

The terminal buds of peaches were shown in three years' cultural and histological studies and field observations [? in Delaware] to harbour the causal organism of shot hole (*Phytomonas* [*Bacterium*] *pruni*) from one season to the next, the maximum number of positive isolations being obtained during the early part of the dormant period and declining rapidly thenceforward. Cultures of the pathogen were also secured from tissues showing no visible lesions along the last 10 to 12 in. of the tip end of the twig, the percentage of positive isolations obtained increasing progressively towards the tip. The intercellular spaces of the terminal buds were also found to contain masses of bacteria.

HAENSELER (C. M.) & DAINES (R. H.). **Peach canker caused by Fusicoccum amygdali.**—Abs. in *Phytopathology*, xxxi, 1, p. 10, 1941.

Peach trees in New Jersey and Rhode Island have recently been observed to bear oval, slightly sunken, brown, well-defined cankers, 1 to 3 cm. in length, nearly always situated at the nodes of young, but not actively growing, twigs and extending half-way round them. With age the cankers become hard, dry, and grey, and usually bear prominent, erumpent pycnidia exuding whitish spore tendrils in damp weather. The twig cankers may cause considerable direct injury, but their chief importance lies in the provision of infection courts for species of *Valsa*, the agents of a destructive blight. A fungus closely resembling *Fusicoccum amygdali* has repeatedly been isolated from the diseased tissues and inoculated into peach twigs with positive results.

REED (H. S.). **Effects of zinc deficiency on cells of vegetative buds.**—*Amer. J. Bot.*, xxviii, 1, pp. 10–17, 9 figs., 1941.

Continuing his earlier studies on zinc deficiency [*R.A.M.*, xviii, p. 43], the author presents the results of several years' investigations in California on the cytology of the apical meristem of shoots from healthy apricot and peach trees and others affected with little leaf from the orchard and from controlled cultures.

The evidence obtained [which is fully described] demonstrated that the first signs of cellular derangement in apricot buds become apparent in the strong affinity of certain meristematic cells for dyes, this being followed by premature vacuolization and polarization. This condition was observed in late winter, before the buds emerged from the resting stage. Initial derangement in peach buds appeared as vacuolization, with less pronounced hyperchromatization of the meristematic cells.

Observations of apricot and peach buds showed that buds of affected trees showed earlier and greater accumulation of phenolic materials than those of healthy trees. Decrease in phenolic compounds was a

feature of the growth of late spring and early summer in both healthy and affected shoots, and it is thought probable that certain phenolic compounds were utilized in metabolism. Both healthy and affected peach buds contained notable amounts of starch and calcium oxalate crystals towards the end of the growing season. The starch occurred chiefly in the cortex, the medullary rays, and the protoxylem, while the calcium oxalate was found mainly in the cortex, the medullary rays, and the pith cells.

The chief effects of zinc deficiency on the trees studied were seen in the hypoplasia induced, the polarization of cell contents, and the inhibition of cell multiplication in the region of the apex. The accentuated accumulation of phenolic materials in the vacuoles resulted in cell enlargement, and was in no instance associated with necrosis.

Dunegan (J. C.) & Smith (C. O.). **Germination experiments with uredio- and teliospores of Tranzschelia pruni-spinosae discolor.**—*Phytopathology*, xxxi, 2, pp. 189–191, 1 fig., 1941.

Vigorous growth of the germ-tubes of *Tranzschelia* [*Puccinia*] *pruni-spinosae discolor* [*R.A.M.*, xvii, p. 756; xix, p. 418] uredospores occurred at a temperature range of 10° to 25° C., the optimum for germination probably lying between 20° and 23° [ibid., x, p. 470]. Germ-tubes on the water agar surface in Petri dishes may reach a length of 750 μ. Variable results were obtained in experiments from 1934 to 1938 at Fayetteville, Arkansas, to determine the effect of environmental conditions on the longevity of uredospores of the rust from various *Prunus* hosts in different States, but storage in an electrical refrigerator at 5° definitely extended the duration of viability (up to 537 days).

Between 23rd February and 14th March, 1939, teleutospores of *P. pruni-spinosae discolor* from overwintered almond leaves in California gave rise within 24 hours to promycelia, basidia, and spores, development taking place from the small, distorted basal cell as well as from the apical [ibid., xix, p. 322]. The sole outstanding difference between the germinating teleutospores of the variety *discolor* from almond and those of the variety *typica* from *Prunus serotina* was in the position of the germ pores, which were near the septum between the two cells in the former, whereas in the latter the pore in the upper cell was apical and in the basal situated near the pedicel. The size and shape of the basidiospores also varied in the two forms, those of the *discolor* variety being subglobose, 8 to 8·5 by 6 to 6·5 μ, and those of the *typica* variety reniform, 12·5 to 16 by 5·5 to 6·5 μ.

Strawberries resistant to red core disease.—*Gdnrs' Chron.*, Ser. 3, cix, 2820, p. 14, 1941.

Following upon seven years' research, involving the testing of some 30,000 seedlings, five new strawberry varieties of good commercial quality and highly resistant to red core [*Phytophthora fragariae*: *R.A.M.*, xix, p. 608] have been released to growers under the names of Auchincruive 1, 2, 4, 5, and 6, Auchincruive being the name of the horticultural department of the West of Scotland Agricultural College from which the selection work was directed. A resistant variety

produced in the United States, and named American Aberdeen, has also been released.

BEAKBANE (A. BERYL). **Studies of cultivated varieties of Rubus and their hybrids. III. A comparative trial of Loganberry and Phenomenal Berry plants grown under different methods of training and spraying to control cane spot disease.**—*J. Pomol.*, xviii, 4, pp. 379–393, 2 figs., 1941.

A full account is given of a five-year trial at East Malling carried out with loganberry and phenomenal berry to ascertain the comparative value for commercial purposes of the two varieties, of four methods of training (as a fan, in one direction on double wirework, in one direction on single wirework, and by weaving), and of two spray treatments for the control of cane spot (*Elsinoe veneta*) [*R.A.M.*, xix, p. 715].

The results showed that loganberry was much more susceptible to infection than phenomenal berry. In 1937, infection was less on plants trained by weaving than by any of the other methods. Infection on fan-trained plants gradually decreased in relation to that shown by the other methods, until in 1939 it was lower on the fan-trained and weaving-trained plants than on the remainder. In the two one-way systems, plants at 6 ft. apart on double wire were more severely affected in 1939 than those 12 ft. apart on single wirework. No differences in vigour or yield resulted from the different spray treatments, but in 1937 plants given an application of colloidal copper in June showed less infection than the unsprayed controls, while in 1938, plants sprayed in May with Bordeaux mixture (2–3 hydrated lime–100) and in June with colloidal copper had less infection than others sprayed in June only.

LEACH (R.). **Banana leaf spot investigations. I. The basis of control.**—*J. Jamaica agric. Soc.*, xliv, 11, pp. 454–457, 1 fig., 1940.

In a study carried out in Jamaica in 1940 into banana leaf spot (*Cercospora musae*) [*R.A.M.*, xix, p. 260; xx, p. 153], observations were made of unfurling heart leaves to ascertain whether a close correlation could be found between the place of infection and the distribution of the spots on the leaves. In the closely furled leaf, the right side lies rolled up in the furrow of the upper surface of the midrib, the left side (with its lower surface towards the exterior) being rolled round the midrib and right side. Marks made daily along the edge of the opening leaf appear on the opened leaf as a series of lines parallel with the edge on the leaf side, but running obliquely across the leaf on the right. More lines appear on the left than right side, the former being exposed for more days than the right. As the evidence indicated that infection would occur more in narrow lines on the left than on the right side, a numerical estimation of spot distribution was made. The fourth, sixth, and eighth oldest leaves (excluding the heart leaf) were examined on ten affected plants in 28 localities, the left and right sides of each leaf being observed separately, and observations recorded on the intensity of the spotting and the percentage of spots seen in distinct lines. The results obtained showed that in five low-rainfall districts (50 plants) the percentages of spots in lines on the fourth, sixth, and eighth leaves

were, respectively, 37, 44, and 37 for the left side, and only 6, 11, and 11 for the right, the corresponding figures for 13 medium-rainfall areas (130 plants) being 55, 48, 41, and 17, 14, 9, and for 10 heavy-rainfall areas (100 plants) 62, 62, 55, and 17, 22, 14. These figures clearly demonstrate that a much higher percentage of spots appears in distinct lines on the left than on the right side. This result supports the view that the most important stage at which infection occurs is during the growth of the heart leaf. The first visible signs of spotting usually occur on about the fourth leaf and the slight difference noted between the relative distribution of the spots in the younger and older leaves strongly indicates that few infections take place after the heart leaf has opened.

While increase in the number of spots on a leaf is generally attributed to new infections, one case was noted where a gradually increasing number of spots was recorded on the left side of a leaf, though no spots appeared on the right for eight weeks. Though heaviest spotting often develops on the left side, especially on the younger leaves, there is less difference in intensity between the two sides in older leaves. If increase in spotting during ageing were wholly due to secondary infection from spores on the primary spots, the number of spots should increase relatively faster on the side showing the more primary spots. That such is not the case indicates that secondary infection does not occur freely.

Greathouse (G. A.) & Rigler (N. E.). **Quantitative comparison of methods for sterilizing solutions of organic compounds used in culture media.**—*Phytopathology*, xxxi, 2, pp. 149–158, 1941.

The losses in respect of fungicidal activity towards *Phymatotrichum omnivorum* [*R.A.M.*, xix, p. 592] from a number of typical organic compounds, including acids, phenols, amines, aldehydes, esters, amides, and glucosides, at 0·01 M concentration by the following methods of sterilization were compared: (1) autoclaving in the presence of water, nutrient medium No. 70 [the composition of which is indicated], or Czapek's solution, (2) intermittent steaming in the presence of water, and (3) dissolving the chemical in alcohol (95 per cent.) and adding usually not more than 1 ml. to each dry sterile flask, allowing the alcohol to evaporate through the plug (for one or two days), and then adding the sterile medium. Both (1) and (2) were found to occasion appreciable losses, whereas (3) except in the case of the most volatile compounds, caused little or no diminution of toxicity to the pathogen. Moreover, should such losses occur, they may be obviated by the addition directly to the medium of concentrated solutions of the compound to be tested in 50 to 95 per cent. alcohol.

Dujarric de la Rivière (R.) & Heim (R.). **Les champignons toxiques. Caractères et détermination toxines, intoxications, thérapeutique.** [Poisonous fungi. Characteristics and determination of the toxins, their effects, and treatment.]– viii + 59 pp., 8 col. pl., 5 figs., Paris, Encyclopédie Médico-Chirurgicale, Éditeur, 1938. [Received 1939.] 55 fr.

In this work, the authors state that they have brought together the best and most recent information available on poisoning due to different

species of the larger fungi. The subject is discussed under the headings: kinds of fungal poisoning, treatment, pathological anatomy, medico-legal diagnosis, and prophylaxis. Under the first section many of the species involved are described and accurately illustrated with excellent plates by A. Bessin, and notes are given on their toxicology. The aim has been to present the information in a strictly scientific, rather than a popular, form. Special mention must be made of the exhaustive bibliography, which runs to over 600 titles.

Benedek (T.). **Use of photomicrography in mycological research.**—*Chron. bot.*, vi, 9, pp. 201–202, 1 fig., 1941.

A description is given of special clamps made by the author to hold a test tube on the fixed stage of a microscope. They are interchangeable with the usual spring clamps, and while holding a test tube fast, allow it to be moved in any direction in the plane of the stage. The arrangement was devised to assist in photomicrography, for which the author recommends the use of a miniature camera.

Sass (J. E.). **Elements of botanical microtechnique.**—ix + 222 pp., 33 figs., London, McGraw-Hill, 1940. 17s. 6d.

This manual of botanical microtechnique is designed to meet the needs of teachers of plant science, and those of beginners in research and is not intended primarily as a work of reference. The first part, comprising 120 pp., is given up to general principles and methods. The second part deals with specific methods recommended for the various phyla, pp. 150–160 being devoted to fungi. The concluding chapters concern the use of the microscope and photomicrography.

Thom (C.). **Out of the furrow.**—*J. Bact.*, xli, 1, pp. 1–15, 1941.

In this paper, a presidential address to the Society of American Bacteriologists at its 42nd annual meeting, St. Louis, 28th December, 1940, some of the problems confronting the author during his thirty years' experience as a collector of moulds are discussed in relation to certain practical applications of microbiological knowledge, with special reference to the control of *Phymatotrichum omnivorum*, the agent of cotton root rot in Texas, by means of the incorporation with the soil at the roots of the plants of potential fungal antagonists, experiments along which lines are still in progress.

Turning to the bewildering state of confusion prevailing in the matter of mould classification, instances of which are cited, the writer deprecates the practice of editors in permitting the publication of inadequately studied organisms as new species, and a plea is made for the appointment, by the Society of Bacteriologists, possibly in co-operation with other interested organizations, of referees for genera, species aggregates, or groups of organisms associated with specific processes, whose aid could be invoked in doubtful cases.

Leach (J. G.). **Insect transmission of plant diseases.**—xviii + 615 pp., 1 pl., 238 figs., London, McGraw-Hill Book Company, Inc., 1940. 42s.

This book is a very welcome addition to the literature of plant

pathology. It brings together for the first time the available information concerning the role of insects in the spread and development of plant diseases. After four introductory chapters in which more general aspects of the subject are discussed, there are chapters on plant diseases caused by toxicogenic insects, and the relation of insects to bacterial, fungous, and virus (two chapters) diseases, and phytopathogenic protozoa. A chapter is devoted to mites, nematodes, and other small animals as vectors, relevant aspects of the anatomy and physiology of plants and insects are dealt with, and a section on technique is included. An appendix lists 115 diseases (toxicity diseases 6, virus 70, bacterial 14, fungous 25), in the transmission of which some 200 species of insects are implicated.

Christenson (L. D.). **Insect vectors in relation to quarantine, eradication, and control of plant viruses.** *J. econ. Ent.*, xxxiii, 6, pp. 827–830, 1940.

In connexion with a general discussion on the relations of insect vectors to the eradication of plant viruses by quarantine and other appropriate control measures, the writer enumerates 15 such carriers of well-known diseases in other countries which are not yet known to act in this capacity in the United States, if present there at all, and which should be rigorously excluded from entry under the Insect Pest Act of 1905.

Thornberry (H. H.). **A proposed system of virus nomenclature and classification.**—Abs. in *Phytopathology*, xxxi, 2, p. 23, 1941.

The system of virus nomenclature and classification [cf. *R.A.M.*, xx, p. 174] proposed by the writer is based on the infectious intracellular agents parasitizing the generally recognized groups of organisms, which are assigned to an Order (Biovirales) ancillary to the bacteria, consisting of three families, viz., (1) Rickettsiae, (2) Phytoviraceae, represented by the genera *Phytovirus*, *Pteridovirus*, *Bryovirus*, *Thallovirus*, and *Bacteriophagus*, and (3) Zooviraceae. The classification of members of (2) is founded on susceptible groups of organisms, modes of transmission, and symptoms on the respective standard hosts. The specific portion of the binomials for *Phytovirus* is compounded of the first syllable, or more, of the generic name of an important host, prefixed to a Latin word describing one of the main symptoms on a respective standard host, e.g., *Phytovirus nicomosaicum* var. *vulgare*. Six rules of proof for a virus disease of plants are suggested.

Dimond (A. E.) & Duggar (B. M.). **Effects of monochromatic ultraviolet radiation on the growth of fungous spores surviving irradiation.**—*Amer. J. Bot.*, xxvii, 10, pp. 906–914, 1 fig., 6 graphs, 1940.

Studies in Wisconsin on the ultra-violet radiation of spores of *Rhizopus suinus* are described, irradiation being effected with the full spectrum of the quartz mercury vapour lamp and with a quartz monochromator (2,650 Å). It appeared that the mycelia produced by irradiated and control spores grew at identical rates, but that in the case of the mycelium from spores surviving radiation growth continued over a longer period. The mycelial mats obtained from irradiated

spores were consequently as much as 20 per cent. heavier than those obtained from the controls.

GOSSOP (G. H.), YUILL (E.), & YUILL (J. L.). **Heterogeneous fructifications in species of Aspergillus.** —*Trans. Brit. mycol. Soc.*, xxiv, 3–4, pp. 337–344, 1 pl., 1940 [issued 1941].

The writers describe the occurrence, in mixed cultures on agar media of various strains of *Aspergillus niger*, *A. nidulans*, *A. cinnamomeus*, *A. schiemanni*, and related colour mutants of fructifications bearing two sorts of conidia [*R.A.M.*, xvii, p. 830], and comprising, in addition to those normal for the original strains, heterocaryotic sporophores and 'fused' sporophores. In the last named each half of each sporophore represents one of the original strains planted. The heterocaryotic fused fructifications were confined to cultures of different mutants of one strain or to those in which one mould was a mutant from the other. They apparently arise as a result of mycelial anastomoses between related strains, which pave the way for nuclear migrations into the developing conidiophores, where repeated divisions take place and thereby furnish a supply of nuclei for the successively forming sterigmata; here again fresh divisions will occur and provide nuclei for the secondary sterigmata. The conidia borne on the latter, like the sterigmata themselves, are uninucleate.

BALD (J. G.) & NORRIS (D. O.). **The effect of the latent virus (virus X) on the yield of Potatoes.** —*J. Coun. sci. industr. Res. Aust.*, xiii, 4, pp. 252–254, 1940.

After stating that almost every plant of the six most commonly grown potato varieties in Australia would appear to carry at least one strain of potato virus X [*R.A.M.*, xix, pp. 38, 670], the authors describe an experiment carried out in 1939–40 to ascertain the effect of the presence of the virus on yield. The seed tubers used were of the President and Factor (Up-to-Date) varieties. The latter were derived from a single tuber which some years previously had been found free from virus X, this being the only X-free stock of any common Australian variety available. Before planting, the clean and infected tubers were indexed by inoculating from each to pepper [*Capsicum annuum*] plants. These tests confirmed the presence or absence of the virus, and demonstrated that the isolates were of average severity. The experiment was arranged so that the unit sub-plot consisted of three plants. Four sub-plots (President with and without, and Factor with and without, virus X) were randomized in a group along a row, similar groups occurring four times in each of five rows. Between adjacent sub-plots single clean President or Factor plants were set to reduce current-season infection between adjacent affected and healthy plants.

During the season no symptoms of virus X were noted on any plant, and no differences in vigour or growth habit were observed between healthy and affected plants of the same variety. In all, 182 plants grew, of which 90 were Factor and 92 President, 89 plants with virus and 93 without, gave yields. The mean yields per plant were 142 and 174 gm. for infected and clean President, respectively, and 148 and

240 gm. for infected and clean Factor, respectively. Thus, the mean loss in yield resulting from infection was 30 per cent. The mean number of tubers per plant was 6·8 and 8·9 for infected and clean President, respectively, and 4·0 and 4·9 for infected and clean Factor, respectively.

These results support the opinion that virus X is one of the main causes of the reduction in yield of potatoes in Australia. As, however, the effects of the virus are spread evenly over the crop, they escape notice.

Bald (J. G.), Norris (D. O.), & Dickson (B. T.). **The shape and development of Potato tubers and their significance in the diagnosis of spindle tuber.** *Phytopathology*, xxxi, 2, pp. 181–186, 1 graph, 1941.

A disease of Factor (Up-to-Date) potatoes in New South Wales, diagnosed as spindle tuber, causes a decrease in the cross sectional area relative to length in tubers of marketable size [*R.A.M.*, iii, p. 296], the shape of the smaller ones being unaffected. Three stages in tuber growth were differentiated by means of logarithmic curves based on measurements for sound and infected plants and the following characteristics noted in the diseased tubers: (1) the rudimentary tubers formed from the stolon tips are of normal shape, but smaller than those produced by healthy plants; (2) growth is uniform in all dimensions from about 0·75 to 2·5 cm. in length, causing lesser expansion in the second stage than that taking place in normal material; and (3) following a transitional period between the second and third stages, growth appears to pursue a comparatively normal course, but as predominantly apical growth begins in smaller diseased tubers, these are narrower in cross-section than sound ones of the same length. An analysis of the measurements made on Green Mountain tubers by Schultz and Folsom [ibid., iii, p. 548] and on Bliss Triumph by Werner [ibid., v, p. 625] gave results similar to those obtained from Factor.

Sanford (G. B.). **Studies on Rhizoctonia solani Kühn. V. Virulence in steam sterilized and natural soil.**—*Canad. J. Res.*, Sect. C, xix, 1, pp. 1–8, 2 figs., 1941.

In this further contribution to his studies of *Rhizoctonia* [*Corticium*] *solani* [*R.A.M.*, xvii, p. 620] the author discusses the pathogenic behaviour of this fungus to potato in natural and steam sterilized soil. Inoculum obtained by growing various isolates on steam sterilized black Edmonton loam was thoroughly mixed with natural virgin, cultivated, or steam-sterilized soil, and disinfected setts cut from tubers of Early Ohio potatoes planted in flasks of these soil mixtures. In both cultivated and virgin series it was evident that about one part of inoculum with 15 of the natural soil was more effective than larger proportions of inoculum; when equal parts of inoculum and natural soil were used, the virulence was distinctly reduced. The experimental results show conclusively that the fungus is much more virulent in the inoculated natural soil, with its natural complement of microflora and fertility, than in the same soil steam-sterilized and inoculated. Isolates that are normally very virulent were found to produce a very slight

amount of disease when potato sprouts grew through soil inoculum not mixed with natural soil. There was definitely less disease and the host more frequently escaped infection when grown in soil already permeated by vigorous growth of the pathogen than when host and pathogen met midway in the soil, owing to the fact that the soil was inoculated seven days after the sett was planted. The formation of sclerotia and the massing of mycelia was more common and abundant in the soil mixtures containing higher concentrations of inoculum than in those containing one part of inoculum to 15 of natural soil. Factors favouring the formation of sclerotia were a water content of the soil slightly above the optimum for the growth of plants and mycelium, an adequate supply of nitrate nitrogen, and a soil temperature range from 16° to 20° C., but especially the first-named. Conditions favouring marked vegetative growth of the pathogen tend to depress its virulence. Isolates of *C. solani* pathogenic to potato were again found to vary greatly in virulence and ability to form sclerotia, the *Corticium* stage being apparently an important source of pathogenic and sclerotia-bearing strains. Experimental evidence was obtained that soil-grown inoculum 180 days old proved to be as virulent as that six days old.

Bernal Correa (A.). **Las enfermedades del Arroz y su importancia económica en el Valle del Cauca.** [Rice diseases and their economic importance in the Cauca Valley.]—*Rev. Fac. nac. Agron. Colombia*, iii, 8–9, pp. 820–850, 1940.

This is a detailed account of the principal diseases affecting the increasingly important rice crop in the Cauca Valley of Colombia, namely, the leaf spots caused by *Helminthosporium oryzae* [*Ophiobolus miyabeanus*], *Cercospora* (possibly *C. oryzae*) and *Piricularia oryzae*; physiological scorch; chlorosis (white leaf), observed for the first time; and straighthead [see above, p. 197].

It has been experimentally shown that the spores of *H. oryzae* germinate between 4° and 40° C., with an optimum from 24° to 30°, coinciding exactly with the mean local temperature. The reaction to the pathogen of 17 varieties was tested under two systems of irrigation, flowing and flooding, of which the former tended to increase, and the latter to diminish, susceptibility. None of the varieties could be classed as highly resistant, the best results being obtained with Lady Wright, Fortune, Majagual, and Guacarí. In addition to appropriate cultural measures, including the flooding of the crop in 15 cm. of water from the first month after sowing until a fortnight before the harvest, seed disinfection may be practised with advantage, especially by means of five minutes' immersion in water heated to 55° to 60° or ten minutes at 53° to 55°, preceded by 24 hours' soaking in a cold bath. Treatment at 55° for five minutes reduced the incidence of infection from 25 to 1 per cent., the corresponding figures for uspulun dust (2 and 4 gm. per kg. seed), copper carbonate (same proportions), a three-minute dip in 1 per cent. mercuric chloride, and 2 per cent. formalin being 10, 8, 8·2, 7·7, 6, and 4 per cent., respectively.

So far the author has detected the presence of the *Cercospora* only on the foliage, interference with the photosynthetic functions of which may be productive of serious damage.

During the period of 1939 to 1940 covered by these investigations, the typical symptoms attributed to *P. oryzae* were in no case observed. Other workers, however, have encountered the 'brusone' disease in the Cauca Valley, and it is therefore probable that the climatic conditions at the time of the writer's visit were unfavourable to the development of the pathogen.

Chlorotic rice plants are recognizable from a distance by the lemon-yellow tone of their leaves, some of which may recover, while others die. The disorder is most conspicuous during two periods of the growing season, namely, between 30 and 60 days and from 100 days onwards, recovery being most frequent in the early attacks. Both the varieties most commonly cultivated in the Cauca Valley, Fortune and Guayaquil, are equally susceptible to chlorosis, but a high degree of resistance was shown at one farm by an early Italian variety, while promising results were also obtained in tests on the above-mentioned 17 varieties with Gigante Vercelli, Guayaquil (resistant type), Majagual, and others. The theory that chlorosis is due to lack of available iron in the soil [cf. ibid., xviii, p. 702] was not supported by experiments in which solutions of 1 to 5 per cent. ferrous sulphate were applied with negative results. A more beneficial line of treatment would appear to consist in the incorporation of organic matter into the soil.

Scorch is characterized by flaccidity and a yellow to deep red coloration of the leaves, leading in persistent cases to the death of the plants in 20 days. The predisposing cause of this disturbance is believed to reside in defective preparation of the soil and irregular irrigation, involving a loss of nutritional equilibrium; the breaking-up of compact masses of soil and uniform levelling are of great importance in control.

Straighthead is most prevalent in virgin soils containing an abundance of organic matter and receiving excessive irrigation. The distortion of the glumes, which is one of the typical features of the disease, is most in evidence in large-grained varieties, such as Fortuna and Guayaquil. Aeration of the soil through the periodical withdrawal of the irrigation water for five or six days is an effective means of control.

KLIPPERT (W. E.). **The cultivation of Hevea Rubber in tropical America.** —*Chron. bot.*, vi, 9, pp. 199–200, 1941.

The only serious problem in *Hevea* rubber cultivation in Central and South America is the leaf disease caused by *Dothidella ulei* [*R.A.M.*, xx, p. 77]. The effects of the fungus are so severe, that before rubber can be grown successfully in these areas, groups of immune or highly resistant clones must be developed. Dusting and spraying appear to be impracticable. Resistant clones are being developed chiefly by selection and artificial cross-pollination. It is fairly easy to select occasional resistant individuals from any seedling nursery, but difficult to obtain both resistance and high yield. Almost all the high-yielding clones developed in the Far East during the past 20 years are susceptible, but the material is useful in crossing with more highly resistant if lower-yielding clones. Suitable resistant clones will, it is expected, shortly be ready for commercial planting on a limited scale.

Garassini (L. A.). **Observación directa de la microflora del suelo por el método de Rossi-Cholodny-Conn.** [Direct observation of the microflora of the soil by the Rossi-Cholodny-Conn method.]—*Rev. Fac. Agron., La Plata*, xxiv (*1939*), pp. 45–56. 3 pl., 2 figs., 1940. [English summary.]

Details are given of the examination, at the La Plata University, Argentina, by Conn's modification (with variations) of the Rossi-Cholodny technique [*R.A.M.*, xviii, p. 128], of four soil samples: (1) garden manured with dung, (2), (3), and (4) under lucerne, broad beans, and wheat, respectively, the results of which showed that Actinomycetes predominate in the first-named and were also abundant in (2) and (3), accompanied by *Alternaria* spores in (1) and (2), and by those of '*Oidium*' in (3); the wheat soil, on the contrary, yielded more fungal mycelium and *Fusarium* spores than Actinomycetes.

Godoy (E. F.). **El 'mildew' o 'tizón' del Pimiento producido por la 'Phytophthora capsici' en la República Argentina.** [The 'mildew' or 'blight' of Chilli produced by *Phytophthora capsici* in the Argentine Republic.] *Rev. Fac. Agron., La Plata*, xxiv, pp. 235–280, 7 pl., 1 fig., 1 map, 1940. [English summary.]

This is a comprehensive, fully tabulated account of the writer's field observations and laboratory studies on chilli (*Capsicum annuum*) blight (*Phytophthora capsici*) in the Argentine [*R.A.M.*, xviii, p. 85], where it was first observed by Lindquist in La Plata during the 1931–2 season [ibid., xii, p. 535] and is now known to occur in the north (Salta and Jujuy), Cuyo (Mendoza), and along the coast, assuming its maximum economic importance in northerly regions. The symptoms of the disease in northern Argentina approximate more closely to those described by Leonian from New Mexico and Weber in Florida [ibid., xii, p. 112] than to the features noted by Lindquist.

The mycelium of the pathogen, both intra- and intercellular, is situated principally in the cortical parenchyma of the infected stem and branches: the mesocarp of the fruits is likewise invaded, cellular disorganization in both cases being induced by the dissolution of the pectin. Both nursery and field plants are affected. The shape of the moist, rugose, dull green lesions differs according to the variety of *C. annuum* attacked, being circular in vars. *abbreviatum* and *cerasiforme* and elongated in vars. *acuminatum* and *largum*; the entire fruit is ultimately involved in either type. The organism was isolated in pure culture on a number of standard media and identified as *P. capsici*. Branches, fruits, and seeds all yielded the fungus, the last-named organs being invaded through the teguments and aleurone layer and thus serving, together with the previous season's haulms, as a source of perpetuation of the disease. Direct penetration of the host through the stem base was shown by inoculation experiments on the Ruby King variety to be possible at the age of 70 days, but the parasite usually enters through wounds inflicted on plants of any age by insects, cultural practices, hail, frost, or other natural agencies. Inoculation tests on other Solanaceae gave negative results.

The optimum temperature and relative humidity for the development of chilli blight epidemics are 24° to 26° C. and over 70 per cent.,

respectively; the prevalence of these conditions influences the host-parasite complex by inducing a state of predisposition to infection in the former and simultaneously promoting the rapid growth of the latter. Both mild and pungent varieties of *C. annuum* are liable to infection by *P. capsici*, the former, however, sustaining much heavier damage (90 to 100 per cent.) than the latter (10 per cent.). In addition to varietal susceptibility, other cultural factors favouring outbreaks of blight are continuous cultivation and the timing of the crop in such a way that the critical stage for infection develops during the rainy period from the end of December to March.

Sardiña (J. R.). **Acerca de la 'blanqueta' del Pimiento (nota preventiva).** [Concerning the 'blanching' of Chilli (preliminary note).] *Bol. Pat. veg. Ent. agríc., Madr.*, ix, 35–38, pp. 1–8, 7 figs., 1940.

Considerable damage is stated to be inflicted on the increasingly valuable chilli crop of Valencia, Spain, covering an area of 2,000 ha., by a virus disease known as 'blanching', salient features of which include mottling and crinkling of the small and medium-sized leaves; the distribution of the normal green and pale green to yellow chlorotic zones is somewhat erratic, but the former tend to be interveinal and the latter to involve the tissues running parallel with the veins. On larger leaves the mottled areas are more extensive, but less numerous, than on the younger foliage, while crinkling is barely perceptible. The skin of affected fruits is of a granular texture with striation or slight creasing of the surface. The virus of 'blanching' was experimentally shown to be transmissible by means of the aphid *Myzus persicae*, as well as by the juice, from diseased to sound plants, but the seed is considered to be of little or no importance as a source of infection, only five out of 173 plants raised from 'blanched' seeds presenting faintly suspicious symptoms in the form of foliar crinkling but no trace of spotting.

Hoerner (G. R.). **The infection capabilities of Hop downy mildew.**—*J. agric. Res.*, lxi, 5, pp. 331–334, 1 fig., 1940.

In inoculation experiments carried out in Oregon between 1931 and 1937, the following hosts, all belonging to the Urticaceae, were successfully infected with the hop downy mildew fungus, *Pseudoperonospora humuli* [*R.A.M.*, xix, p. 302]: several commercial varieties of *Humulus lupulus*, *Celtis mississippiensis*, *C. occidentalis*, *C. sinensis*, *C. tournefortii*, hemp, *H. lupulus* var. *neo-mexicanus*, and *Urtica lyallii*, while *H. japonicus* and its variety *variegatus* both showed some evidence of resistance. In view of the fact that species of the genera *Cannabis*, *Celtis*, *Humulus*, and *Urtica*, which are hosts, respectively, of *P. cannabina*, *P. celtidis*, *P. humuli*, and *P. urticae*, all became infected with *P. humuli*, it is suggested that the four pathogens may prove to be only different physiologic races of a single species of *Pseudoperonospora*.

Santos (P. R.). **Leaf spot of Derris.**—*Philipp. Agric.*, xxix, 8, pp. 641–659, 6 figs., 1941.

Leaf spot is stated to be a prevalent disease of *Derris* spp. in the cultures of the College of Agriculture, Philippine Islands. It also occurs in the Los Baños Economic Garden, the Laguna Provincial Nursery,

where 60 to 70 per cent. of the leaves were affected in July, 1940, and on plants growing on Mount Maquiling. Hybrids of *D. elliptica* and other species and strains of *D. elliptica* and *D. philippinensis* are also severely attacked.

At first, infection appears as minute, brown, circular dots, visible on both sides of the leaf, and surrounded by a band of transparent, greenish or yellowish tissue about 1 mm. wide. This band is surrounded by another, of more or less water-soaked, greenish tissue. Affected leaves become variously distorted, especially when several spots coalesce. In the advanced stage the spots measure 4 to 5 mm. in diameter, and are circular, reddish- to dirty brown, with a distinct brown border about $\frac{1}{3}$ mm. wide, and surrounded by indistinct and diffused yellowish areas. Later, the dry central portion of the spots on the younger leaves falls out, giving the leaves a shot-hole effect. On the older leaves the spots remain circular, and the centres do not drop out. These spots are greyish-brown and thin. In old lesions and during damp weather minute, black pycnidia are found scattered over the spots.

The fungus showed black (light brown when young), globular to flask-shaped pycnidia measuring on the host 45 to 240 μ high by 22·5 to 217 μ broad (average 138 by 101 μ), with one to three ostioles, 5·1 to 15·3 (average 9) μ in diameter, and containing hyaline, ellipsoid to elongate pycnospores, 4·4 to 6·4 by 1·6 to 2·8 (average 5·3 to 2) μ. On sterilized *Derris* leaves the fungus produced abundant, deep brownish-drab, later black pycnidia, 120 to 570 μ high and 9 to 275 μ broad, but none was formed on various agar media tested, of which potato dextrose agar yielded the best growth. In inoculation experiments, infection was noted 24 hours after the mycelium was smeared on *Derris* leaves, and four days after an aqueous suspension of the pycnospores had been sprayed on the plants. In cross-inoculation tests, infection of 13 species belonging to 12 genera from 7 families was obtained. The fungus is identified with *Phyllosticta derridis* P. Henn. though its pycnidia and pycnospores are larger.

Infection appeared to be favoured by damp, cool weather and shady situations, and spore dissemination would seem to take place by means of wind, insects, and splashings from diseased plants. The organism survives unfavourable conditions in the infected host tissues, either on the plant, or on the ground. The author recommends that every effort should be made to prevent the spread of the disease into new areas. Plant disease sanitation should be enforced. *Derris* should be planted in the open, not between trees in orchards, under coco-nuts, or with permanent crops, and a reduction of shade is also advisable. A limited test suggested that spraying with Bordeaux mixture (4–4–50) at monthly intervals from January to September may reduce infection to negligible proportions.

McIntosh (A. E. S.). **Report on a third visit to Jamaica. October, 1940.** —*Bull. Brit. W. Ind. centr. Sug. Cane Breed. Sta.* 22, 17 pp., 1940.

The author states that mosaic disease is now present in all the sugar-cane growing areas of Jamaica [*R.A.M.*, xix, p. 494]. The evidence indicates that at least two, and probably three, distinct strains exist. Effective commercial control is carried out on B.H. 10 (12) at Serge

Island, Frome Estates, Rose Hall, Richmond, and parts of Worthy Park, but in other districts, either because effective control is not the rule, or because the natural environment is highly favourable to the disease, mosaic is prevalent, and is not commercially controlled in this variety. In many such localities B.H. 10 (12) gives good yields in spite of heavy infection. In other parts, B.H. 10 (12) is replaced by commercially resistant types, such as P.O.J. 2878, P.O.J. 2727, M. 28, and F.C. 916.

In most instances, mosaic is so widespread that roguing would be impracticable, and a complete change to resistant types would be necessary. The growing of such canes alone for a few years might be followed by a gradual re-introduction of healthy seed of susceptible varieties, together with the routine growing of seed nurseries, and roguing in them and in plant-cane crops. The usefulness of this method of control would of course depend on whether permanent alternate hosts existed in the vicinity or not.

At the time of the author's visit, 63 seedlings had been received in Jamaica from the Central Cane-Breeding Station. Of these, B. 3013 did well in trials, and should be further tested in good soils with light infestation if it proves to be not more susceptible than B.H. 10 (12). B. 3439 has given exceptionally promising results as a plant cane and is also highly resistant. B. 3254 and B. 35187, which showed much promise in Barbados, were also found resistant in Jamaica. B. 34110 and B. 35204 have shown resistance; the former is suitable only for good soils, but the latter is a general-purpose cane.

It is suggested that whenever planting material is available at Cow Park from a batch of seedlings, planting should be carried out at Hope Gardens to determine reaction to mosaic, so that the status of any seedling in relation to mosaic would be known before extended multiplication and outside distribution had occurred. Twelve stools of any seedling grown in a row would be sufficient. The row should be broken half-way by two stools of B.H. 10 (12) planted from clean material at the same time as the seedling, to serve as a standard of comparison. These rows should alternate with diseased rows obtained by planting affected material of a susceptible variety. Maize should be interplanted at definite intervals through the testing area to attract aphids. The degree of resistance or susceptibility should then be expressed as a comparison with that of B.H. 10 (12), any seedling more susceptible than the standard cane being eliminated. The surviving seedlings should be grown under observation over a wide range of ecological conditions, representing those found in the Jamaica cane-growing areas. Three types of seedlings should be recognized, viz., those suited to good and poor soils, respectively, and general-purpose canes.

It is regarded as imperative that schemes for multiplication and testing should be established as a routine, according to a fixed system, such as that suggested. Emphasis is also laid on the necessity for an investigation into the sugar-cane mosaic problem in Jamaica.

Rafay (S. A.) & Padmanabhan (S. Y.). **Strains of Colletotrichum falcatum Went.**—*Curr. Sci.*, x, 1, pp. 25–26, 1941.

Three distinct types of culture of *Colletotrichum falcatum*, the agent

of red rot of sugar-cane, developed from isolations made in the course of an epidemic in North Bihar, India, in 1939 to 1940, viz., A, characterized by white, later pale grey, cottony, floccose colonies without slimy, pink masses of conidia; B, forming loose, silky colonies, gradually becoming more compact, of an indeterminate shade of grey, abundant dark pseudo-pycnidial masses, and slimy masses of salmon-coloured conidia, growing much faster than A on oatmeal agar; and C, of a compact, velvety texture, darker than A, producing conidia sparsely, and possibly representing an intermediate stage between A and B. Types A and C appear to correspond closely with Abbott's light and dark races, respectively, except for the absence of masses of conidia in A [*R.A.M.*, xviii, p. 344], a culture sent to the United States for comparison being assigned to the dark one.

In inoculation experiments with A and B on the Co. 213, 299, 421, and B. 04 varieties the index of virulence, judged by the rate of spread of the fungus in the setts and calculated by dividing the length of the sett by the length of spread of the organism, was as follows: A in the four varieties in the order given 3·71, 1·49, 2·08, and 1·37, respectively; B, 1·96, 2·52, 2·95, and 4·35, respectively.

Padwick (G. W.). **The red rot epidemic.**—*Indian Fmg*, i, 6, pp. 263–267, 1940.

During the season 1939–40, infection of Co. 213 sugar-cane in northern India by *Colletotrichum falcatum* [*R.A.M.*, xviii, pp. 344, 619] reached locally unprecedented proportions, the attack representing a new phase in the history of the disease in India.

Discussing possible sources of infection, the author states that over a large area of northern India conditions are not very suitable for spore production, especially on the canes. As a rule, spores develop only when the affected canes have completely rotted. During the monsoon, however, the midrib parts of the leaves may bear numerous acervuli, and if conditions permit germination, spores can be spread, with the result that if suitable cane material is available, infection will occur from this source. Locally, diseased setts are a major source of infection. The part played by borers is not precisely known. In the epidemic under discussion, the type of root primordia infection found by Abbott on P.O.J. 213 in Louisiana [ibid., xviii, p. 345] was seen on Co. 213. Possible sources of the fungus comprise mycelium in the mother setts, spores from diseased shoots, leaf spots, and old decayed, diseased canes, spores or mycelium in the soil, and spores from alternate hosts, if any. The fungus may enter the canes from the mother sett to the new shoots, or through borer holes, root primordia, and leaf scars (i.e., the nodal region), the cut end of setts, and various injuries. Leaf entry may take place directly through the epidermis, through insect punctures, and through miscellaneous injuries.

The epidemic may have been induced by the predominance of a vigorous race of the pathogen, as happened in Louisiana [loc. cit.], carelessness in selecting setts for planting resulting in a gradual increase of infected material, until almost the entire stock of Co. 213 had become infected. There is no evidence that Co. 213 was at any time genetically resistant; tests at Pusa at least four years ago proved it to be one of

the most susceptible varieties. Observations during the epidemic showed no correlation between insect attack and infection. The disease was found in soils free from waterlogging, and there is no evidence that susceptibility induced by unfavourable soil conditions is progressive or inherited.

Growers are advised to grow seed-cane material on small plots of well-drained land not situated in low-lying areas. In these plots the crop must be frequently rogued throughout the growing season. The introduction of healthy seed from districts where infection is negligible should be encouraged, at least for planting in nurseries, but it must not be assumed that such material is resistant. The opinion prevalent in some quarters that Co. 299 and Co. 331 are resistant is without foundation. The introduction of healthy material of these varieties would be helpful initially, but without strict supervision of planting practices these varieties will meet the same fate as Co. 213.

Bourne (B. A.). **Sugar Cane varieties in Florida.**—*Facts ab. Sug.*, xxxv, 12, pp. 23–27, 7 figs., 1940.

In the course of this survey of the activities of the Agricultural Research Departments of the United States Sugar Corporation in the Everglades region of Florida, the writer points out that selection for disease and pest resistance is a matter of fundamental importance, since without this character only low yields would be possible. Of the major diseases, the following disorders caused by *Helminthosporium*, viz., eye and ring spots [*H. sacchari*] and brown stripe [*Cochliobolus stenospilus*: *R.A.M.*, xx, p. 178], mosaic, root rot, and red rot [*Colletotrichum falcatum*], have been the chief objects of attention. As an example of successful breeding along these lines may be cited the F. 31–436 variety, the principal rival of the former standard P.O.J. 2725 for Okeechobee muck (custard apple) soils, the ancestry of which comprises one-quarter of D. 74 (an old Louisiana commercial strain) 'blood', while Louisiana Purple and Chunnee are represented through P.O.J. 213 and *Saccharum spontaneum* through P.O.J. 2725. The new selection is very resistant both to the *Helminthosporium* infections and mosaic.

Bourne (B. A.). **Eye spot of Lemon Grass.**—*Phytopathology*, xxxi, 2, pp. 186–189, 1 fig., 1941.

Pure cultures of a species of *Helminthosporium* isolated from lemon grass (*Cymbopogon citratus*) in the Florida Everglades were grown on sterile leaves and maize meal agar, and found to correspond exactly in spore dimensional and other morphological characters with *H. ocellum* (or *H. sacchari*) [*R.A.M.*, xiii, p. 12] from B. 3124 sugar-cane. The only previous record of the fungus on a host other than sugar-cane is that of Voorhees, who observed it, also in Florida, on *Pennisetum purpureum* [ibid., xvii, p. 754]. On *C. citratus*, however, the colour of the lesions differs from that described for the other grass host, four zones being distinguishable at maturity, viz., a pale flesh- or straw-coloured centre, surrounded by a dark purple, narrow, oval border, encircled in turn by a Spanish raisin-coloured zone, and finally by a yellowish- to flesh-tinted areola; at this stage the spots measure 4 to 10 by 1·5 to 2 mm. Inoculation experiments with the fungus from *C. citratus* gave positive

results both on the original host and on Otaheite sugar-cane, and conversely, an isolate of *H. ocellum* from the B. 3124 sugar-cane proved capable of attacking lemon grass.

BELL (A. F.). **Report of the Division of Entomology and Pathology.**—*Rep. Bur. Sug. Exp. Stas Qd, 1939–40*, pp. 16–20, 1940.

The following items are included in this report [*R.A.M.*, xix, p. 236]. It is proposed to remove the sugar-cane H.Q. 285, which is susceptible to gumming disease (*Bacterium vasculorum*), from the approved variety list for 1941; it is hoped that once the infection centres of the now non-approved S.J. 4 have been removed, spread of infection to the more resistant standard varieties such as Badila and H.Q. 409 will be curtailed [ibid., xix, p. 116]. In resistance trials conducted at Bundaberg, the variety Co. 515, a cross between P.O.J. 2725 and sorghum, proved more susceptible to the gumming disease than the susceptible standards; Q. 13, Q. 20, and the Hawaiian 31–1389 appeared highly resistant, and Q. 10 commercially so. In an uncompleted trial at Brisbane Q. 28, Q. 29, and the Hawaiian 28–4291, 31–2484, 31–2806, 32–1063, 32–3575, and 32–8560 appeared to be satisfactorily resistant.

The Fiji disease situation is stated to be rapidly improving in southern Queensland owing to the extensive control campaigns carried out by the local Cane Disease Control Boards [ibid., xix, p. 236; xx, p. 144]. In resistance trials it was found that although P.O.J. canes transmit susceptibility to Fiji disease to a large proportion of their progeny, some highly resistant seedlings are produced. In resistance trials completed during the year, no infection was found on Co. 352, Co. 355, or Co. 356; 0 to 10 per cent. infection on Q. 42, Q. 43, and Q. 813; 10 to 20 per cent. on Q. 2 and S.C. 12/4; and 20 to 40 per cent. on P.O.J. 2878 and D. 1135.

Downy mildew (*Sclerospora sacchari*) [loc. cit.], which is stated to be still the most important disease of sugar-cane in Queensland, is reported from the Mossman, Cairns, Lower Burdekin, Mackay, and Bundaberg districts. Owing to the extent to which the disease spreads from diseased fields of P.O.J. 2878 to the more resistant standard varieties, it became necessary in 1938 to prohibit further plantings of this variety over most of the Mackay district. Field observations indicate that downy mildew can spread within a radius of $\frac{1}{4}$ mile, or in a few cases, of one mile. By comparing the number of diseased stools per unit area in Bundaberg, the varieties P.O.J. 2878, P.O.J. 213, P.O.J. 234, and D. 1135 (in that order) were found to be the most susceptible; Co. 290, P.O.J. 2725, Q. 813, and 1900 Seedling fairly resistant; and Mahona (N.G. 22), grown on the river flats, fairly susceptible. It was observed that, as a general rule, late harvested ratoons developed more downy mildew than those harvested early. This is explained by the facts that (*a*) early cut cane is often harvested before the fungus has penetrated into the crown of the stool and the diseased stool is cured by excision; and (*b*) ratoons of late cut cane are exposed to heavier sources of infection while they are still young and therefore more susceptible. Downy mildew was again found to pass easily to maize [ibid., xix, p. 166] and also to teosinte (*Euchlaena mexicana*). Sorghum was generally more resistant than maize: no definite symptoms developed on any of the

sorghums tested in Brisbane, but at Bundaberg fairly heavy infection was observed on American Early Red and unconfirmed leaf markings on Schrock sorghum; at Mackay one plant of Coleman sorghum became infected and others showed suspicious markings. Taking account of the danger to sugar-cane crops from maize infected with downy mildew a proclamation has been recently issued in the Bundaberg area providing that no maize crop can be planted and grown without a written permit. In a ratooning experiment the susceptibility of P.O.J. 2725 to downy mildew was greatly increased by ratooning in summer. Hot-water treatment of diseased setts for 20 minutes at 52° C. gave partial control of downy mildew, and 20 minutes at 54° and 10 minutes at 56° appeared completely effective. In resistance trials at Cairns no infection was observed in varieties Q. 13, Q. 29, Badila, H.Q. 409, or H.Q. 458; 0 to 10 per cent. infection in Q. 2, Q. 19, S.J. 4, H.Q. 426, Oramboo, Korpi, P.O.J. 2725, and B. 147; 10 to 25 per cent. in Q. 10, Q. 44, Pompey, D. 1135, and Co. 290; 25 to 50 per cent. in Q. 27, P.O.J. 213, and P.O.J. 2878; and over 50 per cent. in Co. 419, P.O.J. 2940, and S.J. 16. In trials at Bundaberg no infection was found in Q. 20, Q. 29, Atlas, Juno, Oramboo, 90 Stalk, E.G. 1, Co. 515, or *Erianthus*; 0 to 10 per cent. infection in Q. 10, Q. 13, Q. 27, Q. 43, Q. 813, 1900 Seedling, and P.O.J. 213; 10 to 25 per cent. in Q. 23; 25 to 50 per cent. in Co. 356 and 31–1389; and over 50 per cent. in P.O.J. 2878.

In continued experiments on the control of chlorotic streak [ibid., xix, p. 237; xx, p. 178] it was found that setts of Badila averaging 3·75 cm. diameter and pre-heated for two to three minutes gave rise to apparently healthy plants after immersion in water at 44° for 20 minutes. When individual buds on diseased stalks were selected at random and the buds only treated with flowing water at 52° for 20 minutes, 17 out of 23 untreated buds gave rise to diseased plants as compared with 14 treated buds, suggesting that the infection is not restricted to the bud. When selected portions of a stalk with several nodes on each were treated, in a rubber sleeve, with water at 52° for 20 minutes, complete control was achieved, while the eyes above and below the treated sections gave rise to diseased shoots. Attempts at mechanical inoculation gave negative results.

Leaf scald [*Bact. albilineans*: loc. cit.] was somewhat more prevalent in north Queensland following the more extended planting of the gumming resistant variety Oramboo, and farmers are advised to exercise more care in cutting plants. In resistance trials in the Mulgrave area, the percentages of infected stools produced from sett inoculation with leaf scald were 92 in H.Q. 426, 75 in Mahona (N.G. 22), 45 in H.Q. 409, 42 in Badila, 36 in Oramboo, 17 in Cato, 12 in Q. 29, 7 in D. 1135, 6 in Jason, and 5 in *Erianthus*.

A few stools infected with dwarf disease [ibid., xviii, p. 274] were found on four farms in the Mackay district, where the disease does not normally occur.

Sartoris (G. B.). **Necrotic stripes in Sugarcane.**—*J. Hered.*, xxxi, 12, pp. 515–520, 4 figs., 1940.

The dark brown stripes on the green backgrounds of the stalks and leaves of Striped Uba sugar-cane (*Saccharum sinense*), which was

imported into the United States from Natal in 1935, and has since been grown at Arlington Farm, Virginia, and Canal Point, Florida, were found to be composed of necrotic tissue. This is bacteriologically sterile, and for the time being the condition can only be attributed to a somatic mutation.

Padwick (G. W.), Mitra (M.), & Mehta (P. R.). **The genus Fusarium. IV. Infection and cross-infection tests with isolates from Cotton (Gossypium sp.), Pigeon pea (Cajanus cajan) and Sunn-hemp (Crotalaria juncea).**—*Indian J. agric. Sci.*, x, 5, pp. 707–715, 2 pl., 1940.

With a view to reconciling the conflicting evidence regarding the ability of the species of *Fusarium* isolated from cotton, pigeon pea, and *Crotalaria juncea* to pass from one host to another and cause infection [*R.A.M.*, xviii, p. 501; cf. also ibid., xx, p. 82], the writer carried out isolation and cross-inoculation experiments with 51 isolates from all three hosts, the results of which are tabulated and discussed.

Only one of the 16 cotton isolates caused wilting, but a number of them prevented normal germination of one or more of the three hosts. For instance, F 140 practically inhibited the germination of cotton and pigeon pea, F 142 exerted a very adverse effect on cotton and *C. juncea* but not on pigeon pea, while F 153 was detrimental to all three. None of these cotton isolates appeared to be capable of causing wilt at a later stage in the development of the plants. Owing to the appearance of a certain number of wilted plants in the controls, only a minimum of ten wilted plants was accepted as a reliable index of pathogenicity. On this basis the results clearly showed that most of the wilt-producing strains are almost if not entirely restricted to the original host, except that F 13 and F 15, isolated from *C. juncea*, induced wilting of pigeon pea, possibly because these isolations were made before the technique had been perfected and may have come from the superficial cortical tissue. It is of interest to note that the most severely pathogenic isolates made only poor or moderate growth on the mixture of soil and maize meal used as inoculum, whereas the relatively innocuous strains ramified in the substratum and produced considerable aerial mycelium.

Bondartzeva-Monteverde (Mme V. N.) & Vassilievsky (N. I.). К биологии и морфологии некоторых видов **Ascochyta** на бобовых. [A contribution to the biology and morphology of some species of *Ascochyta* on Leguminosae.]—*Acta Inst. bot. Acad. Sci. U.R.S.S., 1938*, Ser. II (Pl. Crypt.), pp. 345–376, 20 figs., 1940. [English summary.]

Artificial infection experiments carried out from 1930 to 1932 at the Botanical Institute of the U.S.S.R. Academy of Sciences, showed that among the species of *Ascochyta* parasitic on Leguminosae there are some specialized on one host, and others capable of infecting many. To the former group belong *A. fabae* on broad beans (*Vicia faba*), *A. pisi* on peas [*R.A.M.*, xvii, p. 427], *A. rabiei* on *Cicer arietinum* [ibid., xviii, p. 86], *A. lentis* n.sp. [with a Latin diagnosis] on lentils, and *A. onobrychidis* n.sp. [with a Latin diagnosis] on sainfoin (*Onobrychis sativa*), all of which produce severe infection only on their

respective common hosts and merely traces of infection on other plants. Furthermore, all these species are separated on the basis of their behaviour in pure culture.

A. fabae was more ready to form aerial mycelium in the first transfers, showed olive-green patches in the mycelium, and formed noticeably larger brownish pycnidia and larger conidia than *A. pisi*, the average size of the conidia on oat agar being 18·6 by 4·5 μ in *A. fabae* and 13·3 by 4·1 μ in *A. pisi*. The growth of *A. ralniei* on oat agar differed entirely from that of the other species of this genus, its pycnidia emitting a characteristic pink slime, which in some places coalesced to form a continuous pink mass. *A. lentis* is described as causing small, round, whitish lesions, 0·1 to 0·4 cm. in width, with an indefinite or narrow, brownish margin on the leaves and fruits of lentils, involving considerable losses to the crop, especially in the Ukraine. The pycnidia are generally gregarious, immersed, depressed-globose, 175 to 300 μ in diameter, with a minute, round ostiole, and with a yellowish-brown pseudoparenchymatous context. The conidia are cylindrical, straight or rarely curved, rounded at the ends, with a median septum, 11·5 to 19·5 by 3·5 to 5·8 μ. On oat agar the fungus produced numerous dark pycnidia with dark brick-coloured exudate, forming abundant slightly pinkish aerial mycelium only after repeated transfers, and, as a further difference from *A. pisi*, coloured the substratum dark purple. In culture the conidia measured 13·5 to 17 by 4 to 5·7 (average 14·9 by 4·7) μ. *A. onobrychidis*, collected in the Ukraine and the Caucasus, is stated to attack mainly the stems, on which it produces elongated, ochraceous or brownish lesions with a narrow, dark margin; on the leaves the spots are usually small, more or less rounded, ochraceous, with a narrow, dark brown margin. The pycnidia on the stems may be scattered, densely aggregated, or even sometimes coalescent, depressed-globose, dark brown to black, and slightly prominent, 115 to 120 μ in diameter, with an ostiole 20 to 30 μ in diameter; on the leaves they are light brown, sparse, immersed, and measure 115 to 250 μ in diameter. The conidia are cylindrical, with rounded ends, usually uni- but sometimes bi- or triseptate, not at all or slightly constricted, 13·5 to 20 by 4·5 to 6 (average 17 by 5·2) μ. In pure culture the fungus on the whole resembled *A. pisi*, but was more ready to form aerial mycelium and produced noticeably larger pycnidia, the conidia on oat agar measuring on an average 15·4 by 4·9 μ. *A. orobi* Sacc. var. *onobrychidis* Prill. & Delacr. is cited as a synonym.

The plurivorous group was represented by *A. phaseolorum*, which produced only slight infection both on its common host, beans (*Phaseolus vulgaris*), and on a number of other leguminous plants as well as *Lapsana communis*, belonging to the Compositae; *A. medicaginis* Fuck. [ibid., xviii, p. 320], thought to be a synonym of *A. imperfecta* [ibid., xvii, p. 13], to which several species of *Medicago* were susceptible; a species of *Ascochyta* on *Orobus vernus* (not yet named pending further studies) which also infects clover, although both only slightly; and probably *A. sojaecola* [ibid., xi, p. 88]. An intermediate position with regard to host specialization was occupied by *Didymella* [*Mycosphaerella*] *pinodes* with its conidial stage *A. pinodes*), which infected a number of leguminous plants slightly, but peas more severely than does *A. pisi*, the

latter also undergoing a longer incubation period in the host. The descriptions of all species studied are illustrated by drawings of the spores.

Nikolaeva (Mme T. L.). К монографии некоторых родов из сем. **Polyporaceae** европейской части Союза и Кавказа **(Trametes, Daedalea, Lenzites).** [A contribution to a monograph of some genera of the family of Polyporaceae from the European part of the Union and the Caucasus (*Trametes, Daedalea, Lenzites*).]—*Acta Inst. bot. Acad. Sci. U.R.S.S., 1938*, Ser. II (Pl. Crypt.), pp. 377–431, 42 figs., 1 diag., 1940. [German summary.]

This is a list, with a key and extensive critical notes, of 25 species of *Trametes*, 4 of *Daedalea*, and 5 of *Lenzites*, including some new varieties and forms, based on material from the Leningrad herbaria collected in the European part of the U.S.S.R. and the Caucasus.

Tranzschel (V. G.). К биологии ржавчинных грибов Дальневосточного края. [On the biology of rust fungi from the Far East.]—*Acta Inst. bot. Acad. Sci. U.R.S.S., 1938*, Ser. II (Pl. Crypt.), pp. 323–344, 1940. [German summary.]

This list of 27 species of rusts, including four new to science and one re-named, is based on material collected by the author in 1927 and 1929 in the southern parts of the Far Eastern region of the U.S.S.R.

Cummins (G. B.). **New rusts from America and Africa.**—*Bull. Torrey bot. Cl.*, lxviii, 1, pp. 43–48, 1941.

Seven of the eleven new rusts comprising this critically annotated list [with Latin diagnoses] were collected by F. C. Deighton in Sierra Leone; the unusual features of one of these involved the establishment of a new genus, *Ypsilospora* (Puccinaceae).

Mundkur (B. B.). **Some fungi from Afghanistan.**—*Kew Bull., 1940*, 7, pp. 285–288, 1941.

The following are among the fungi collected by the writer during a visit to Afghanistan in the summer of 1939: *Ustilaginoidea virens*, *Entyloma oryzae*, and *Helminthosporium oryzae* [*Ophiobolus miyabeanus*] on rice [*R.A.M.*, xix, p. 301], *Sphacelotheca sorghi* on *Sorghum halepense*, *Tilletia foetida* [syn. *T. foetens*] on wheat, *Aecidium mori* on mulberry (*Morus alba*) [ibid., xvii, p. 347], *Melampsora lini* on *Linum usitatissimum*, *Uromyces fabae* on peas, *Alternaria solani* and *Cercospora concors* [ibid., xix, p. 6] on potato, *H. teres* on barley [ibid., xvii, pp. 449, 514, 737], and *Septoria tritici* on wheat [ibid., xvii, p. 383].

Hotson (H. H.). **The genus Armillaria in western Washington.**—*Mycologia*, xxxii, 6, pp. 776–790, 3 figs., 1940.

In this account of 15 species of *Armillaria* found in western Washington the author gives a key incorporating a more or less complete description of each species. This is followed by a discussion of the individual species regarding synonymy, habitat, and matters of systematic interest. *A. mellea* is said to be very common around Puget Sound.

Mayor (E.). **Notes mycologiques X.** [Mycological notes X.]—Reprinted from *Bull. Soc. neuchâtel. Sci. nat.*, lxiv, 19 pp., 1939. [Received April, 1941.]

The following items are selected from this further instalment of the author's mycological studies from 1936 to 1938 in the canton of Neuchâtel, Switzerland [cf. *R.A.M.*, xvi, p. 277]. *Erysiphe cichoracearum* was observed on lettuce leaves in September, 1938. Inoculation experiments with aecidia of *Coleosporium petasitis* from the needles of *Pinus montana* on *Petasites albus* resulted in the profuse development of uredospores on this host. The aecidial stage of *Milesia* [*Milesina*] *vogesiaca* was detected on *Abies alba* needles [ibid., xv, p. 469] in 1937, and its genetic relationship with the uredo phase of the same fungus on *Dryopteris aculeata* experimentally confirmed. Inoculation experiments with teleutospores of *Puccinia graminis* on *Mahonia* [*Berberis*] *aquifolium* gave consistently negative results, whereas abundant infection was obtained by the same means on barberry, *B. gagnepaini*, *B. polyantha*, *B. thunbergii*, *B. virescens*, and *B. wilsonae*.

Carrera (C. M.). **El género 'Fusarium' en la República Argentina. Estudio y clasificación sistemática (segunda contribución).** [The genus *Fusarium* in the Argentine Republic. Study and systematic classification (second contribution).]—*Rev. argent. Agron.*, vii, 4, pp. 277–296, 12 figs., 1940.

This is a critically annotated list of twelve species of *Fusarium* occurring in the Argentine Republic, namely, *F. avenaceum*, isolated in the Chaco from cotton, and recently observed (for the first time) in Uruguay on *Lupinus albus*, *L. angustifolius*, and lentils; *F. equiseti* var. *bullatum* (new to the Argentine) has been isolated from *Chionaspis citri*, a new insect host; *F. reticulatum* [*R.A.M.*, x, pp. 242, 435]. *F. sambucinum* var. *minus*, and *F. conglutinans* var. *citrinum* on Klein 11 flax, lucerne, and chilli (*Capsicum annuum*), respectively; *F. orthoceras* (first record for the Argentine) on nursery pines and *Ricinus* [*communis*] branches, the same fungus having also been detected a short time ago in Uruguay on *L. angustifolius* and lentils; *F. orthoceras* var. *longius*, described for the first time from Uruguay on flax; *F. oxysporum* and its var. *medicaginis* on lupin and lucerne, respectively, in Buenos Aires; *F. dianthi* on carnations (a new record for the Argentine); *F. vasinfectum* causing chilli wilt [ibid., xix, p. 676]; and *F. vasinfectum* f. 1 on cotton.

Lists are given of both the species of *Fusarium* and their respective hosts in the Argentine Republic.

Dana (B. F.). **Morphological and anatomical features of phyllody in varieties of Tomatoes and Beans.**—*Phytopathology*, xxxi, 2, pp. 168–175, 4 figs., 1941.

In the phylloid blossoms produced by tomato plants suffering from big bud in Oregon [*R.A.M.*, xx, p. 93] the carpels were often represented by simple leaflets adhering by their margins or fully separated. In beans (common [*Phaseolus vulgaris*], Lima [*P. lunatus*], and soy-beans) similarly affected, the phylloid ovary varied from an inflated, sac-like structure, through a marginal-veined leaf with marginal leaflets

replacing the ovules, to leaves of normal aspect. An extension of the axis between adjacent whorls of the phylloid flower developed in the absence of adhesion or union between the vascular traces supplying these organs. Common beans further showed secondary or accessory phylloid flowers, inflorescences with phylloid blossoms, and shoots produced by axis extension beyond the carpel of the primary flower. Vegetative modifications of the perianth were characteristic both of tomato and beans, members of the perianth whorls being represented in extreme cases by phylloid structures. The stamens failed to mature normally, but persisted and remained separate in the phylloid tomato flower.

Wellman (F. L.) & Blaisdell (Dorothy J.). **Pathogenic and cultural variation among single-spore isolates from strains of the Tomato-wilt Fusarium.**—*Phytopathology*, xxxi, 2, pp. 103–120, 1 fig., 1 diag., 1941.

The authors studied 2,031 monospore isolates of *Fusarium bulbigenum* var. *lycopersici* from 18 parent strains of the tomato wilt fungus [*R.A.M.*, xx, p. 91] at the Division of Fruit and Vegetable Crops and Diseases of the Bureau of Plant Industry, Beltsville, Maryland. The maximum degree of variation in cultural type and pathogenicity was observed in isolates derived from parents of a predominantly saltating character. With three exceptions, such variations tend in the direction from cultures with profuse aerial mycelium (the most highly pathogenic) to those with growth almost or entirely appressed to the surface and submerged in the agar or liquid (the least virulent). Cultural variations were not correlated with the spore-form of origin (micro-, macro-, or chlamydospores). The raised form of culture evidently constitutes the basic type, since it alone gave rise to all five classes of variants described in the previous instalment of these investigations [loc. cit.]. The isolation of single spores from sectors, and selection through successive generations of monospore isolations, resulted in the development of strains of the fungus with the characteristics referred to above.

Melchers (G.), Schramm (G.), Trurnit (H.), & Friedrich-Freksa (H.). **Biological, chemical, and electron-microscopical investigation of a mosaic virus from Tomatoes.**—*Biol. Zbl.*, lx, pp. 524–556, 1940. [Abs. in *Chem. Abstr.*, xxxv, 3, p. 772, 1941.]

A virus designated 'tomato mosaic Dahlem 1940' was isolated from naturally infected tomato plants [? at the Biological Institute, Dahlem, near Berlin]. It resembles the tobacco mosaic virus, but can be distinguished from the latter by biological tests. The mode of isolation and characters of the virus protein are described, and the differences between the new mosaic and that of tobacco enumerated.

Swingle (R. U.), Tilford (P. E.), & Irish (C. F.). **A transmissible mosaic of American Elm.**—Abs. in *Phytopathology*, xxxi, 1, p. 22, 1941.

A mottled-leaf condition, resembling a virus disease, of the American elm [*Ulmus americana*] was first observed near Cleveland, Ohio, in 1927, since when trees with similar symptoms have been seen in other parts of the same State and elsewhere in the east. As a rule, some leaves

on the affected trees are normal in size and texture, while others are abnormally large or small, stiff, and often distorted. The small leaves show a typical yellow and green mottling, accompanied by rugosity, and sometimes by a mild to moderate 'brooming' of the branches. The wood of diseased trees seems dry and is frequently brittle. So far, none of the diseased trees under observation has died, though a gradual decline in vigour is apparent from year to year, and an unsightly appearance is imparted by the thinning of foliage and death of the scattered branches. In June, 1940, 19 out of 22 healthy elms grafted with patches of diseased bark a year earlier showed typical mosaic symptoms [cf. *R.A.M.*, xiv, p. 462; xvii, p. 543].

RAY (W. W.). **A new host for Taphrina bacteriosperma.**—*Mycologia*, xxxii, 6, pp. 752–755, 2 figs., 1940.

Taphrina bacteriosperma is recorded for the first time on yellow birch (*Betula lutea*) in Canada, causing blister-like, yellow to yellowish-red lesions on the leaves. The asci of the fungus arise from the subcuticular mycelium, and are in most cases wider below than at the top though they may be nearly cylindrical, with rounded to slightly truncate apical and basic ends; they measure 38 to 65 by 14 to 17 μ, the base occasionally attaining a width of 25 μ. The spores are numerous, ellipsoidal, 3 to 7 by 1 to 2 μ.

MILLER (P. W.). **Current investigations on the control of Walnut blight in Oregon.**—*Rep. Ore. St. hort. Soc., 1940*, pp. 135–139, 1941.

An attempt to reduce the incidence of walnut blight [*Bacterium juglandis*: *R.A.M.*, xx, p. 39] in Oregon by fertilization with ammonium nitrate, ammonium sulphate, ammonium phosphate, calcium nitrate, gypsum, and muriate of potash, used alone or in combination, was unsuccessful, the results indicating that fertilization has but little, if any, effect on the incidence of blight infection on the nuts.

Current field trials again confirmed the fact that copper oxalate compares favourably with Bordeaux mixture as regards efficiency [ibid., xviii, p. 423]. In one trial, three applications of copper oxalate containing 20 per cent. metallic copper (3 lb. to 100 gals.) plus a rosin emulsion sticker (1 pint to 100 gals.), applied at the early pre-bloom, late pre-bloom, and early post-bloom stages reduced the incidence of infected nuts from 50·6 to 3 per cent., while three applications of a 4–1–100 Bordeaux mixture plus a heavy oil emulsion (1 quart to 100 gals.), reduced it to 1·1 per cent. In none of the copper oxalate trials was any foliar injury observed. It is concluded from the results of seven years' experiments that copper oxalate is practically as effective under Oregon conditions as Bordeaux mixture, provided it is used at a sufficiently strong concentration and the applications properly timed and thorough. It has the further advantage of being non-injurious to foliage. Copper oxalate is, however, about twice as expensive at present as Bordeaux mixture, and its use cannot, for economic reasons, be recommended.

Red cuprous oxide caused no foliar injury, but proved less effective than either copper oxalate or Bordeaux mixture.

In conclusion, Bordeaux mixture 6–2–100 is recommended for general use, with the addition of a mineral oil (1 pint to 100 gals.) or oil emulsion

(1 quart to 100 gals.), to the pre-bloom sprays to reduce the severity of injury to the foliage. Alternatively, copper oxalate may be used where cost is a secondary consideration, at the rate of 4 lb. of the product containing 20 per cent. metallic copper or 3 lb. of that containing 40 per cent. to 100 gals.

TAYLOR-VINJE (MARY). **Studies in Ceratostomella montium.**—*Mycologia*, xxxii, 6, pp. 760–775, 30 figs., 1940.

In this paper the results are given of a cytological study of *Ceratostomella montium*, causing a blue stain in lodgepole pine (*Pinus contorta*) in Wyoming. A description of the fungus by Caroline Rumbold is stated to be in the press. The author states, *inter alia*, that at the time the ascospores reach their full size, or shortly before, the ascus wall disappears leaving the spores lying free in the perithecial cavity.

HUNGATE (R. E.). **Nitrogen content of sound and decayed coniferous woods and its relation to loss in weight during decay.**—*Bot. Gaz.*, cii, 2, pp. 382–392, 1940.

In an investigation in Texas of the fungous decay [unspecified] of conifers under natural conditions, it was found that the amount of nitrogen in *Pinus monticola* averages 0·048 per cent. of the dry weight of the sapwood and 0·031 per cent. of the heartwood. A comparison of the dry weight, specific gravity, and nitrogen content values in samples (about 6 to 8 in. long and containing both sapwood and heartwood) of sound and decayed western white pine (*P. monticola*), western hemlock (*Tsuga heterophylla*), western red cedar (*Thuja plicata*), and white fir (*Abies grandis*) showed no significant change in the total nitrogen content during decay, although in white fir the rotten sapwood showed slightly less and rotten heartwood slightly more nitrogen than the sound samples. The average specific gravity of both sapwood and heartwood was higher in sound samples than in rotten ones, the difference being smallest in *T. plicata*. The fruiting bodies of the fungi contain a larger percentage of nitrogen than is found in the wood and their presence is taken to demonstrate a capacity on the part of the fungi to transport nitrogen for some distance through the wood. The results of the present analyses indicated that soil nitrogen was not transferred as far as the points from which samples were taken. Comparison of the amount of wood lost through decay and maximum amount of nitrogen available show that the wood loss is 500 to 700 times as great as the total available nitrogen. The experiments of Findlay [*R.A.M.*, xiii, p. 485] and Schmitz and Kaufert [ibid., xvi, p. 358] with added nitrogen are considered to indicate that the nitrogen present is utilized more effectively during decay than is that added. The results also emphasized the extreme economy with which the nitrogen in the wood is utilized, and this may explain in part the great success of certain fungi in destroying wood.

GREEN (D. E.). **Hygiene in the war-time vegetable garden. I. II. III.**—*J.R. hort. Soc.*, lxvi, 1, pp. 28–33; 2, pp. 56–61; 3, pp. 91–96, 19 figs. (facing pp. iii, xv, 87), 1941.

The potato being of primary importance as a war-time vegetable,

simple directions are given for the recognition and control of a number of the diseases commonly affecting the crop in England. Popular notes are also given on the symptoms, mode of infection, and control of diseases of cabbages and related crops and peas.

HASKELL (R. J.) & BOSWELL (V. R.). **Disease-resistant varieties of vegetables for the home garden.**—*Leafl. U.S. Dep. Agric.* 203, 7 pp., 1940.

After making brief, general reference to the chief means of preventing fungal disease in vegetable garden crops (e.g., by the use of resistant varieties, clean seed, seed and soil disinfection, rotation, and spraying and dusting), the authors give brief popular notes on some of the principal diseases of asparagus, beans, cabbage, celery, cucumber, lettuce, muskmelon [*Cucumis melo*], potato, spinach, pumpkin [*Cucurbita pepo*], sweet corn, squash [*C. maxima*], and tomato, and specify the varieties resistant to them.

PURVIS (E. R.) & HANNA (W. J.). **Vegetable crops affected by boron deficiency in Eastern Virginia.**—*Bull. Va Truck Exp. Sta.* 105, pp. 1721–1742, 8 figs., 1 map, 1940.

Field and greenhouse experiments [which are described] carried out in eastern Virginia on the effect of boron deficiency on vegetable crops showed that at least 16 crops grown locally under field conditions are affected, the deficiency being evidenced by growth response to applied borax or by the appearance of malnutrition symptoms. The maximum safe applications of borax under the local conditions are as follows: 5 lb. per acre for cowpeas, cucumbers, snap beans [*Phaseolus vulgaris*], and strawberries, 20 lb. for celery, muskmelon, peas, potatoes, squash, and watermelon, 30 lb. for cabbage, carrot, collard, maize, eggplant, kale, lettuce, lima bean, okra, onion, chilli, radish, spinach, and sweet potato, and 50 lb. for beet, cauliflower, mustard, tomato, and turnip. On soils where any one crop is affected the authors recommend that borax should be applied at the rate of not over 10 lb. per acre for beet, carrot, cauliflower, celery, maize, eggplant, kale, lettuce, mustard, sweet peppers [*Capsicum annuum*], potato, sweet potato, radish, tomato, and turnip.

FRANK (A.). **Seed treatment just one phase of Cabbage black rot control.**—*Market Gr. J.*, lxviii, 1, pp. 22–23, 1941.

Even chemically treated cabbage seed sown in virgin soil has been observed to suffer from black rot [*Pseudomonas campestris*] in certain sections of the United States [*R.A.M.*, xviii, p. 565; xix, p. 250, *et passim*], the pathogen being conveyed to fresh sites by means of insects (aphids may travel for a distance of two to three miles), wind, rain water wash, or irrigation water. Kitchen-garden and volunteer plants near commercial fields may also serve to tide the bacterium over the summer months and act as sources of fresh infection for autumn plantings. Seed from the Puget Sound (Washington) region may safely be sown without treatment, according to J. C. Walker (*Fmrs' Bull. U.S. Dep. Agric.* 1439, p. 18) and F. D. Heald (*in litt.*), but all other stocks should be disinfected by three minutes' immersion in 1 in 1,000 mercuric chloride.

DENNIS (R. W. G.). **Dry rot of Swedes. The importance of seed-borne infection.**—Reprinted from *Scot. Fmr*, *1941*, 4 pp., 1 fig., 1941.

To determine how far a very low degree of infection of swede seed

by *Phoma lingam* [*R.A.M.*, xi, p. 345; xiii, p. 487; xix, pp. 70, 194] may be capable of initiating an outbreak of dry rot in the subsequent crop, the author in May, 1940, sowed Magnificent purple-topped swede seed bearing 1·02 per cent. infection and a small amount of Tipperary seed bearing 1·6 per cent. infection. The former was divided into four lots, one being treated on 1st May with agrosan G (2 oz. per bush.), one with ceresan at the same rate, one with hot water (122° F. for 20 minutes), and one remaining untreated; the latter was divided into two lots, hot-water-treated and untreated. The seed was sown in small plots of presumably clean land, and also in a swede field, in the latter case as part of the normal six-course rotation. The remainder of the field was occupied by an unnamed swede grown from uninfected seed.

On 6th August the mean amount of infection present in the large and small plots of Magnificent was: control, 1·4 per cent., agrosan-treated, 1·2 per cent., ceresan-treated, 0·08 per cent., hot-water-treated 0 per cent., Tipperary control 1·3 per cent. (the plot with Tipperary hot-water-treated seed was slow in brairding and was resown with ceresan-treated seed), ceresan-treated (field only), 0 per cent., hot-water-treated (small plot), 0 per cent.

Subsequent observations showed that where the seed-borne infection was eliminated by the hot-water treatment, the disease was almost completely controlled. Even at the end of October, it was still absent on the small hot-water-treated plots of both varieties; in the corresponding field plot of Magnificent 0·3 per cent. infection was present, probably mainly caused by spread from the contiguous, heavily infected agrosan plot.

The evidence is considered to indicate that under the conditions prevailing on the farm in question, soil-borne infection by *P. lingam* was negligible, any loss that occurred being directly due to seed-borne infection. Spread was considerably reduced by the dry conditions prevailing in 1940, so that a loss of 11·4 per cent. of the Magnificent crop as a result of 1·02 per cent. seed-borne infection may be regarded as a minimum, not a maximum, effect.

Control by seed dressings was only partly effective, probably owing to the varying degree to which the mycelium had penetrated the seed before treatment. However, ceresan dusting reduced loss at the end of October from 11·4 to 4·7 per cent. for Magnificent and from 3·8 to 1 per cent. for Tipperary seed.

Hot-water treatment seems to be the only truly effective method so far known of dealing with infected seed. The treatment is not easy to apply, owing to the narrow range of temperature which is both effective and safe, and the difficulty of drying the treated seed. If drying is not effected quickly, the treated seeds swell and lose the seed coats. The method cannot be recommended for use on a large scale by merchants and farmers.

The most suitable means of control of seed-borne infection would appear to lie in the production of healthy seed. As the amount of infection present in a seed sample can be reliably estimated in five weeks at most, it would appear to be desirable, where large stocks are involved, to make such a determination before placing the seed on the market, so that the most heavily infected samples may be discarded.